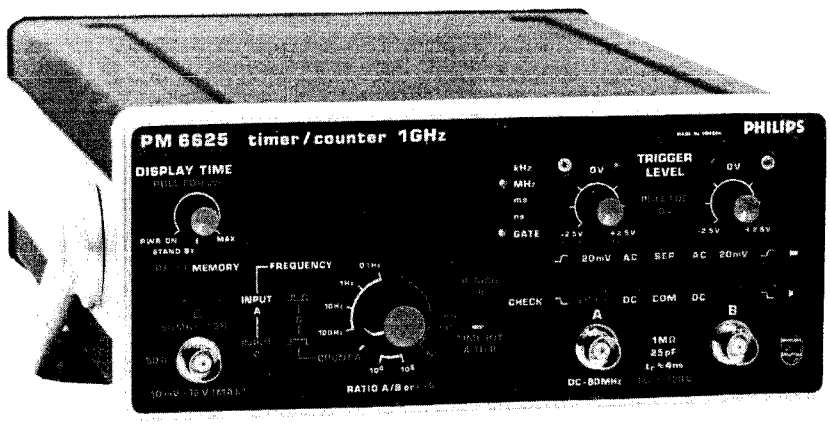
PHILIPS

PM 6622

9446 066 220.1

PM 6624

9446 066 240.1



PM 6625

9446 066 250.1

IMPORTANT

In correspondence concerning this instrument, please quote the type number and the serial number as given on the type plate on the rear of the instrument.

Printed in Sweden / Irkå-Tryck AB

CONTENTS

List of figures

I. INTRODUCTION

GENERAL INFORMATION

The counters in the PM 6620-series have frequency ranges from D.C. up to 80 MHz, 520 MHz and 1 GHz respectively for the PM 6622, PM 6624 and PM 6625.
All models can measure frequency, ratio, period, time interval and have a totalizing mode.
Optional accessories such as four different oscillators, a battery unit, a BCD output unit, a D/A converter and a BUS interface system extend the range of application.

II. TECHNICAL DATA

Properties expressed in numerical values with statement of tolerances are guaranteed. Numerical values without tolerances are intended for information purposes only and indicate the properties of an average instrument. The numerical values hold good for the nominal mains voltage.

A. MEASUREMENTS

Frequency

Range	DC . . . 80 MHz. Input A. All models 50 . . . 520 MHz. Input C. PM 6624 50 . . . 1000 MHz. Input C. PM 6625
Gate times	10 ms, 100 ms, 1 s and 10 s. Input A
Resolution	100 Hz, 10 Hz, 1 Hz and 0.1 Hz. All models
Accuracy	±1 count ± time base error

Single Period B

Range	100 ns . . . 10^5 s (DC . . . 10 MHz)
Frequency counted	10 MHz or 10 kHz
Time resolution	100 ns or 100 µs
Accuracy	±1 count ± trigger error* ± time base error

Period average B

Range	1 Hz . . . 10 MHz
Frequency counted	10 MHz
Number of averagings	N = 10^2, 10^4 and 10^6
Time resolution	$\frac{100\ ns}{N}$
Accuracy	±1 count ± trigger error*/N ± time base error

Time interval A—B

	Single	Average
Range	100 ns . . . 10^5 s	1 ns . . . 1 s
Frequency counted	10 MHz or 10 kHz	10 MHz
Time resolution	100 ns or 100 µs	$\frac{100\ ns}{\sqrt{N}}$
Number of averagings		N = 10^2, 10^4, 10^6
Min. time stop to start		250 ns
Accuracy	±1 count ± trigger error** ± time base error	±5 ns ± time base error $\frac{\pm 100\ ns \pm \text{trigger error}^{**}}{\sqrt{N}}$
Time interval repetition rate	max. 5 MHz	max. 4 MHz

Count A

Range	1 to 999999999
Mode	Accumulates pulses on channel A during time interval between start and stop signal or gate signal at input B
Pulse pair resolution	12 ns

Frequency ratio A/B or C/B

Range	fA: DC . . . 80 MHz. All models fB: DC . . . 10 MHz. All models fC: 50 . . . 520 MHz. PM 6624 fC: 50 . . . 1000 MHz. PM 6625
Multiplier	$N = 10^4$ and 10^6
Accuracy	± 1 count $\pm \frac{\text{trigger error* of B}}{N}$

Check	10 MHz internally applied to channel A and B
HOLD OFF on	The hold off duration will be displayed if SINGLE PERIOD B is selected. PM 6622.

Auxiliary functions

Reset	Pushing RESET button resets the counter, releasing it starts new measurement.
Start/Stop and Gated by B	In function COUNT A the gate time is controlled either by start/stop or gate signal at input B. Mode of operation is selected by a slide switch at the front panel.
Display time	Continuously variable between 0.2 . . . 5 s and infinite of display time knob is pulled.
Stand by	The switch is combined with display time control. Position STAND BY keeps an oven oscillator heated.
Memory	Switchable by push-button MEMORY
Trigger hold off	Active in the time-interval and the period mode. PM 6622.
Range	Approximately 10 . . . 500 µs, 500 µs . . . 100 ms if control knob is pulled. Hold off time is monitored at output gate open.

* Trigger error is $\leq \pm 3 \times 10^{-3}$ for sine wave signals with signal to noise ratio of ≥ 40 dB.

** Trigger error for any wave shape is $\leq \pm \frac{2.5 \times 10^{-3}}{\text{Signal slope (V/ns)}}$ ns

B. INPUT CHARACTERISTICS

Input A and B

Range	
DC coupled	DC . . . 80 MHz } Input B is functionally limited to 10 MHz
AC coupled	100 Hz . . . 80 MHz } Input B is functionally limited to 10 MHz
Sensitivity	Sine wave: 20 mV_{rms} Pulses: 60 $mV_{p\text{-}p}$ for pulse width ≥ 6 ns
Impedance	1 MΩ//25 pF
Coupling	DC and AC
Attenuation	× 1 and × 10
Trigger level	Preset 0 V or variable between ±2.5 V with high resolution around 0 V.
Safe overload	
Attenuation × 1	≤ 440 Hz: 250 V DC or 230 V_{rms} > 440 Hz: falling to 12 V_{rms} at 1 MHz
Attenuation × 10	Max. 250 V DC or 230 V_{rms}.

Input C

(Not present in PM 6622)	**PM 6624**	**PM 6625**
Frequency range	50 . . . 520 MHz	50 . . . 1000 MHz
Dynamic voltage range	10 mV_{rms} . . . 12 V_{rms} (—27 dBm . . . +35 dBm)	10 mV_{rms} . . . 12 V_{rms} (—27 dBm . . . +35 dBm)
Impedance	50 Ω	50 Ω
VSWR	<2	<2
Coupling	AC	AC
Attenuation	by automatic PIN diode attenuator, maximum 62 dB.	
Prescaling factor	8	16
Safe overload	12 V_{rms}	12 V_{rms}
AM tolerance	98 % at 5 kHz modulation frequency 30 % at 1 MHz modulation frequency	All models

D OUT/IN 10 MHz

External oscillator input or internal oscillator output. Selectable by a switch at the rear panel.

Range	1 kHz . . . 10 MHz
Sensitivity	500 mV_{rms}
Coupling	AC
Impedance	≈ 10 kΩ
Safe overload	50 V_{rms}

EXT. RESET/START

0 V ±0.4 V applied to EXT. RESET input will reset the counter.
If DISPLAY TIME is set to position ∞ one new measurement will be initiated when the EXT. RESET is returned to > +2.4 V (max. 5.5 V) or the input is left open.

Input current: Max. 0.4 mA at 0.4 V

* Above 960 MHz, the sensitivity of the PM 6625 might drop to 14 mV_{rms} (—24 dBm) at 1 GHz

C. OUTPUT CHARACTERISTICS

D OUT/IN 10 MHz

Internal oscillator output or external oscillator input. Selectable by a switch at the rear panel.

Output frequency	Internal oscillator frequency, 10 MHz.
Signal level	≈ 1 V_{rms}, open circuit.
Output impedance	≈ 200 Ω, short circuit proof.
Coupling	DC

GATE OPEN

Output level	< 0.4 V during main gate open ≈ 1.5 during hold off time. PM 6622 > 2.5 V during main gate closed.
Output impedance	≈ 400 Ω.
Delay	Internal delay between the signal inputs and the trigger monitor output is approximately 65 ns.

DISPLAY

9 digits.
In plane 7 segment gas discharge display with decimal point indication.

Gate lamp

Indicates that main gate is open and counting takes place.
In stand by position the Gate lamp indicates that mains or battery voltage is connected.

Unit annunciators

kHz, MHz, ms and ns.

D. GENERAL CHARACTERISTICS

Oscillator — See Chapter VIII.

Supply

By mains	100 . . . 130 V or 200 . . . 260 V, 50 . . . 400 Hz max. 20 VA depending on options.
By external battery	+ 11.5 to 28 V approximately 8 W.
By internal battery option	PM 9673

Environmental characteristics

Temperature	
Operating	0° C . . . 50° C 0° C . . . 40° C with battery option PM 9673.
Storage	—40° C . . . 70° C —40° C . . . 50° C with battery option PM 9673.
Mains interference	Below CISPR (22/3, 29/2 and 40/1)
Altitude	5000 m operating 15000 m storage.
Shock	Meets the requirements of the IEC 68 Eb recommendations.
Vibration	Meets the requirements of the IEC 68 F recommendations.

Dimensions

Width	210 mm
Height	89 mm
Depth	325 mm
Weight	Approximately 2.8 kg.

III. ACCESSORIES

1. Standard accessories supplied with the instrument

1 mains cable
1 manual
1 1.6 A fuse ,fast action
1 "115 V" label

2. Accessories to be ordered separately

2.1. Oscillators
PM 9677 Standard oscillator
PM 9678 TCXO
PM 9679 Oven-enclosed oscillator 1×10^{-7}/month
PM 9690 Oven-enclosed oscillator 1.5×10^{-9}/24 h.

2.2. Output interface units
PM 9674 BCD output unit
PM 9675 D/A converter

2.3. Input interface accessories
PM 9351 Passive measuring probe 10 MΩ,/11 pF 220 MHz, attenuation 10×
PM 9353 FET probe, 1MΩ/3.5F, 220 MHz
PM 9584 Resistive mixing piece, 50 Ω, 3 BNC sockets
PM 9346 Active-probe power supply

2.4. Coaxial cables
PM 9074 50 Ω, BNC to BNC,length1 m
PM 9588 Set of 50 Ω cables, BNC to BNC:
5 cables, length 20.7 cm
4 cables, length 40.5 cm
3 cables, length 60.3 cm
3 cables, length 198.6 cm

2.5. Mains cable
PM 9011 3-core detachable mains cable

2.6. Rack mount adapter
PM 9669 19″ rack mount adapter

2.7. Battery unit
PM 9673 Internal battery unit

2.8. Carrying case
PM 9672 Carrying case for the instrument

IV. INSTALLATION

1. Mains voltage conversion

The instrument can be converted into two mains voltage ranges 100—130 V and 200—260 V. The frequency range is 50 to 400 Hz. At delivery the instrument is set to the 200 to 260 V range.
When changing to the 100 to 130 V range the connections of the mains transformer should be changed as shown in figure IV-1, and the label "230 V" covered with the "115 V" label supplied.

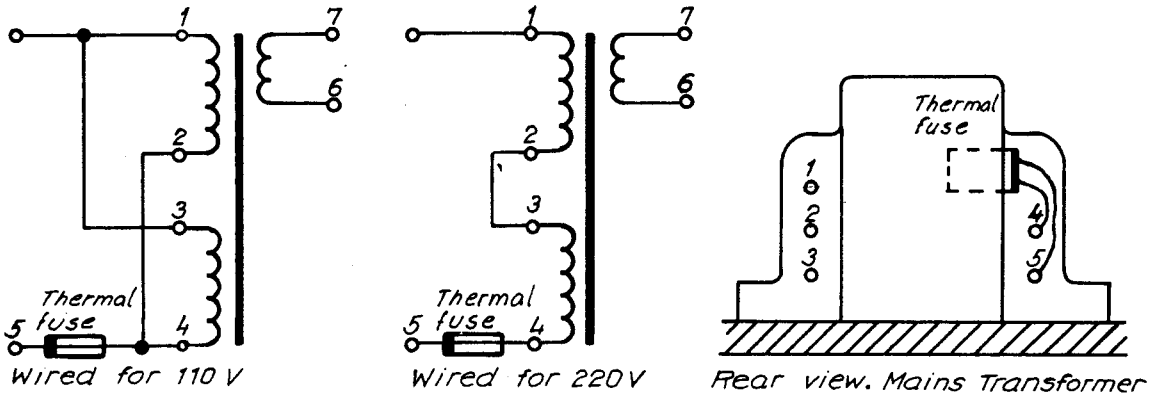


Figure IV-1. Mains transformer connections

2. Earthing

The local safety regulations prescribe how the instrument should be earthed. Two ways are possible:

1. Via the protective earth terminal at the rear panel.
2. Via the three core mains cable plugged into an outlet with protective earth contact.

NOTE: Use only **one** of these alternatives to avoid hum!

3. Fuses

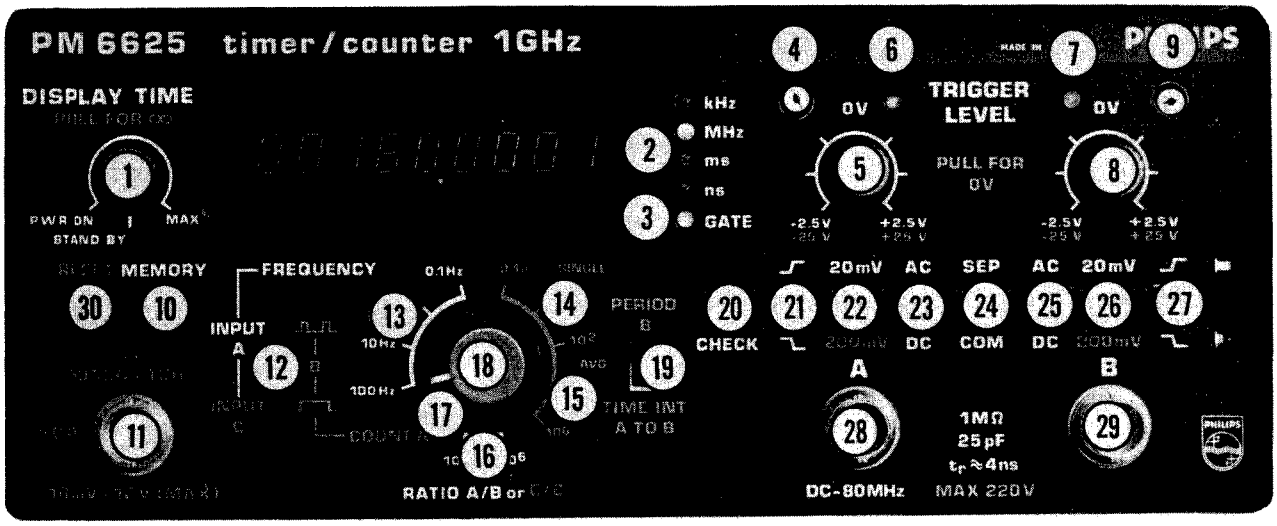
A thermal fuse on the mains transformer and a 1.6 A fuse, fast action, on unit U1 are protecting the power supply.

4. Optional accessories

Refer to installation instruction given in manual for each type number.

V. CONTROLS, INDICATORS AND CONNECTORS

Front panel PM 6624 and PM 6625



1. Display time control

Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.
Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns

Unit annunciators.

3. Gate lamp

Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A

Output socket for set trigger level.

5. Trigger control channel A

Sets trigger level from —2.5 V to +2.5 V when the attenuator is in position 20mV, and from —25 V to +25 V when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A

Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B

Same as trigger lamp channel A.

8. Trigger control channel B

Same as trigger control channel A.

9. Monitor socket channel B

Same as monitor socket channel A.

10. Memory

In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Input C

Input socket for frequency and ratio measurement.

12. Start-Stop by B/Gated by B and Input A/Input C

In the upper position it sets counter to measure Count A Start-Stop by B, Frequency A, or Ratio A/B and in the lower position it sets counter to measure Count A Gated by B, Frequency C or Ratio C/B depending on how the Function Selector is set.

13. Frequency A and C

Sets counter to measure frequency at inputs A and C. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single

Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μs.

15. Average

Sets counter to measure Multiple Period B or Time Interval Average A to B. 10^2, 10^4 and 10^6 are number of averagings.

16. Ratio A/B or C/B

Combined with Input A/Input C switch it selects Ratio A/B or Ratio C/B measurement. 10^4 and 10^6 are multipliers.

17. Count A

Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector

Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B

Sets counter to measure Period B or Time interval A to B.

20. Self check

Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A

Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A

Provides 10 × attenuation of the input signal.

23. AC/DC selector channel A

Selects AC or DC coupling of the input signal.

24. Separate/Common via B

Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B

Same as AC/DC selector channel A.

26. Attenuator channel B

Same as attenuator channel A.

27. Slope selector channel B

Same as slope selector channel A.

28. Input A

Input socket for frequency, ratio and time interval measurement.

29. Input B

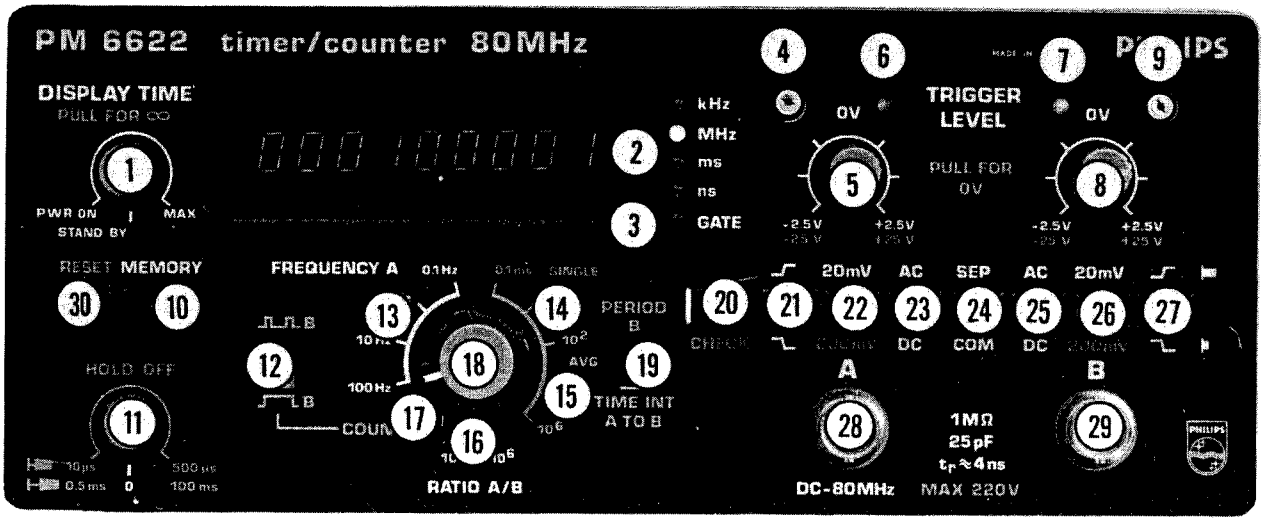
Input socket for period, ratio and time interval measurement.

30. Reset

Resets counter and display to zero.

V. CONTROLS, INDICATORS AND CONNECTORS

Front panel PM 6622



1. Display time control

Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.
Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns

Unit annunciators.

3. Gate lamp

Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A

Output socket for set trigger level.

5. Trigger control channel A

Sets trigger level from —2.5 V to +2.5 V when the attenuator is in position 20mV, and from —25 V to +25 V when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A

Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B

Same as trigger lamp channel A.

8. Trigger control channel B

Same as trigger control channel A.

9. Monitor socket channel B

Same as monitor socket channel A.

10. Memory

In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Hold off control

In Single Period and Single Time Interval this control disables retriggering of the main gate until the set hold off time is out.

12. Start/stop by B-Gated by B

In the upper position it sets counter to measure Count A Start-Stop by B, in the lower position counter will measure Count A Gated by B.

13. Frequency A

Sets counter to measure frequency at input A. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single

Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μs.

15. Average

Sets counter to measure Multiple Period B or Time Interval Average A to B. 10^2, 10^4 and 10^6 are number of averagings.

16. Ratio A/B

Sets counter to measure ratio between signals at input A and B. 10^4 and 10^6 are multipliers.

17. Count A

Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector

Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B

Sets counter to measure Period B or Time interval A to B.

20. Self check

Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A

Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A

Provides 10 × attenuation of the input signal.

23. AC/DC selector channel A

Selects AC or DC coupling of the input signal.

24. Separate/Common via B

Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B

Same as AC/DC selector channel A.

26. Attenuator channel B

Same as attenuator channel A.

27. Slope selector channel B

Same as slope selector channel A.

28. Input A

Input socket for frequency, ratio and time interval measurement.

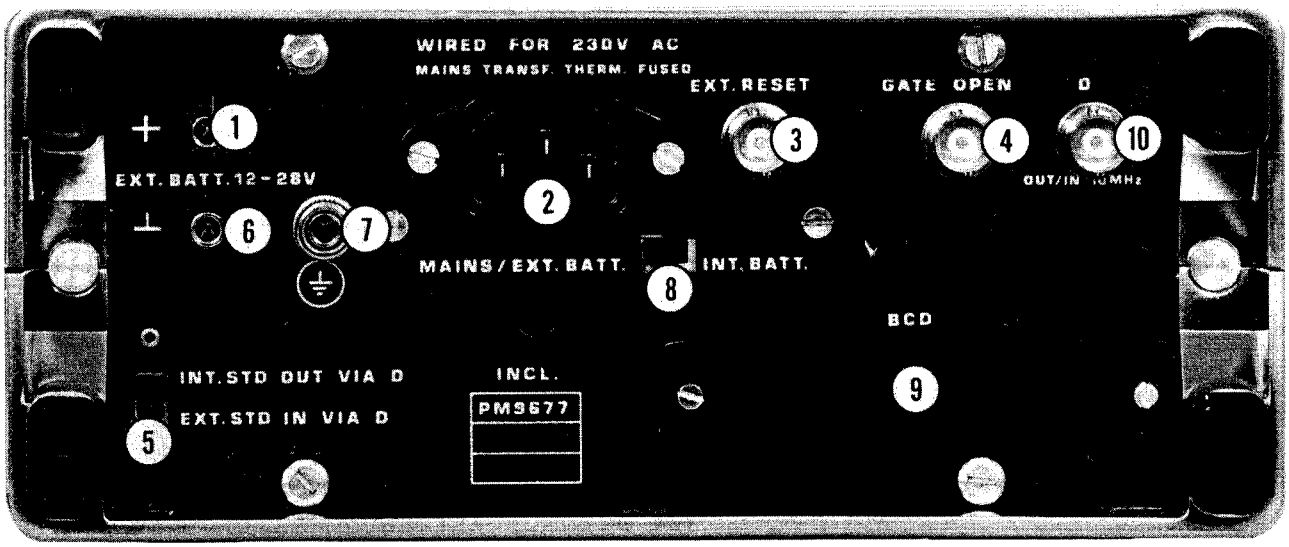
29. Input B

Input socket for period, ratio and time interval measurement.

30. Reset

Resets counter and display to zero.

Rear panel PM 6622 . . . 25



1. External battery socket

Plus pole input socket for external battery.

2. Mains input

Input socket for the mains.

3. External reset input

Input socket for reset/start signal.

4. Monitor socket gate signal

Output socket for gate and hold off (PM 6622) signals.

5. Internal/External Standard switch

Sets operating mode of input D to either internal 10 MHz out or external 10 MHz in.

6. External battery socket

Minus pole input socket for external battery.

7. Chassis ground

Protective earth terminal.

8. Mains/Battery switch

Sets power supply to be fed from external or internal power source.

9. BCD and D/A connector

Output connector for the BCD and D/A units.

10. Internal/External Standard socket

10 MHz out or external 10 MHz in.

Top view PM 6622 . . . 25

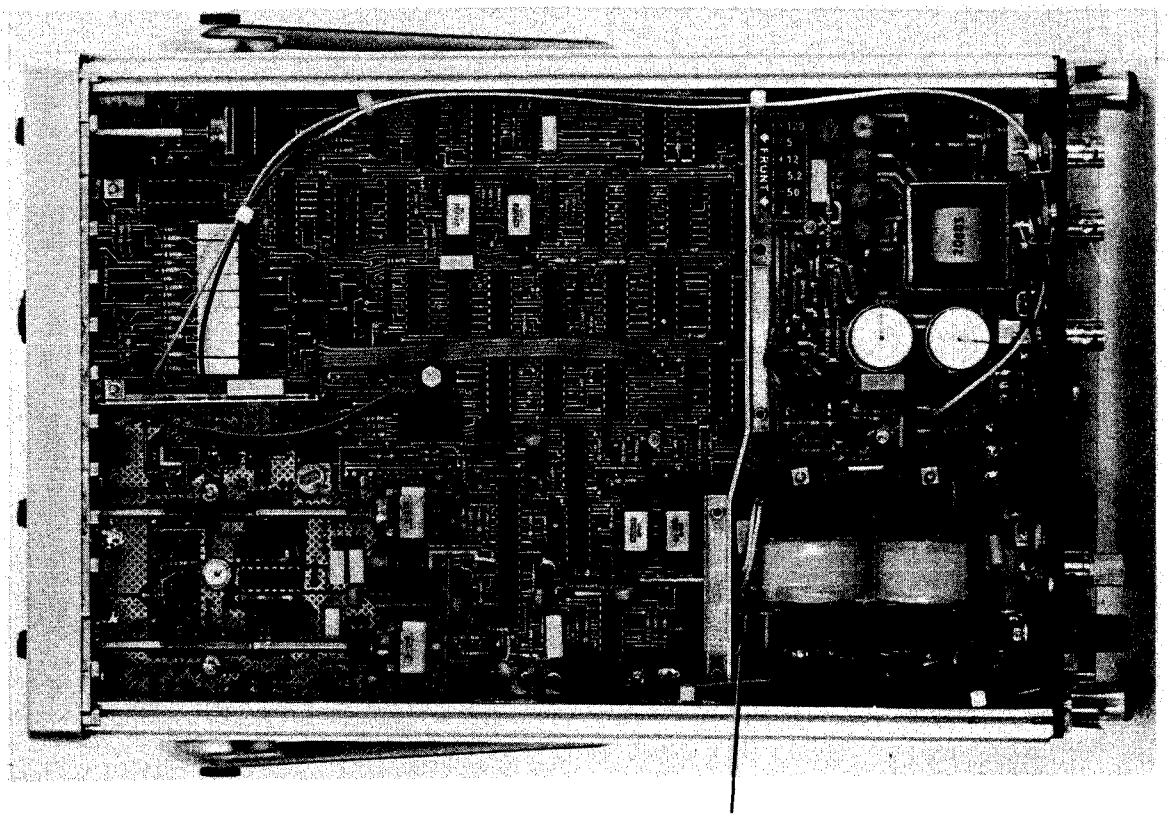
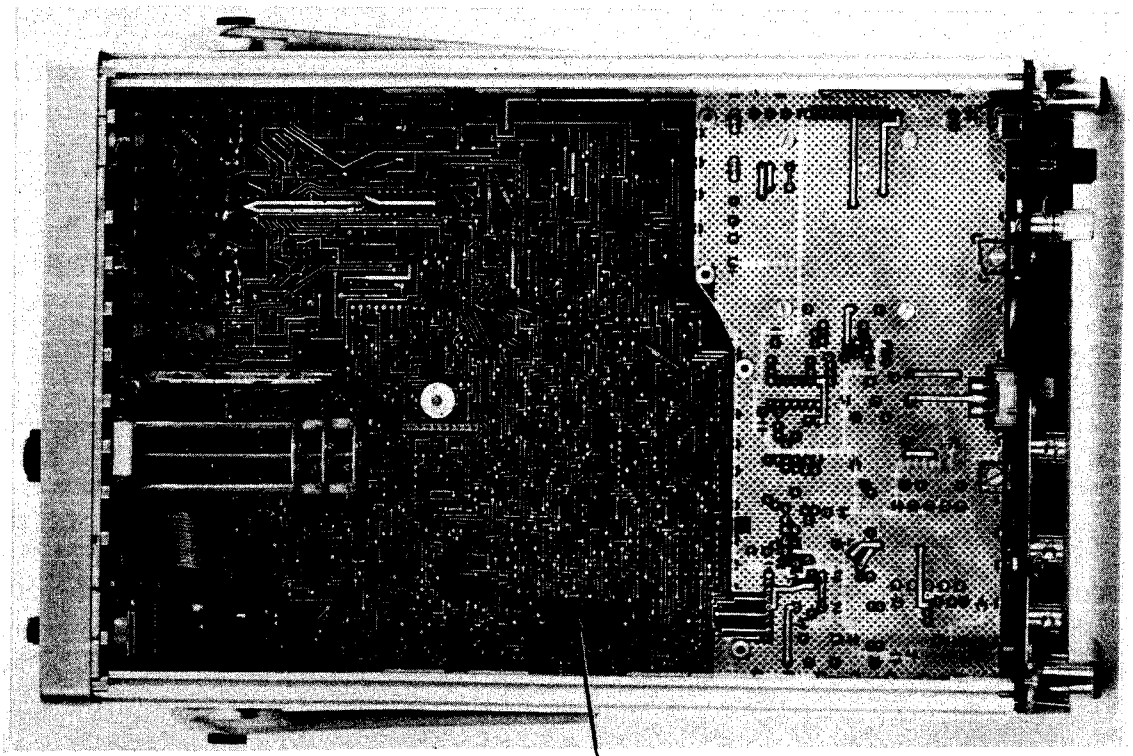


Fig. V-1. Top view of PM 6622 . . . 25

1.6 A fuse fast action.

Bottom view PM 6622 . . . 25



VI. OPERATION
General Information

1. Switch on power

1.1. Mains

Before the counter is connected to the mains check that the mains transformer is wired for the local mains voltage as described in chapter IV.1. Mains voltage conversion

— Set switch MAINS EXT. BATT/INT. BATT on the rear panel to position MAINS EXT. BATT.
— Connect the mains cable to input socket for the mains at the rear panel.
— Set DISPLAY TIME control at the front panel to position ON.
— Check that display turns on indicating that power is on.

1.2. External battery

— Set switch MAINS EXT. BATT/INT. BATT at the rear panel to position MAINS EXT. BATT.
— Connect the cables from the external battery to sockets EXT. BATT. 12—28 V at the rear panel.
— Set DISPLAY TIME at the front panel control to position ON.
— Check that display turns on indicating that power is on.

1.3. Internal battery PM 9675

— Set switch MAINS EXT. BATT/INT. BATT. at the rear panel to position INT. BATT.
— Set DISPLAY TIME control at the front panel to position ON.
— Check that display turns on indicating that power is on. Blinking display indicates low voltages. Refer to manual PM 9673 for charging instructions.

2. Warm up time

The warm up time from the moment of mains connection is less than 7 minutes to an oscillator error of less than 10^{-7} for instruments equipped with the oven-enclosed oscillators PM 9679 and PM 9690. Instruments equipped with the oscillators PM 9677 or PM 9678 (TCXO) are ready for use at the moment of mains connection.
Normally the instrument is switched on from the STAND BY position. If so, no warm up time is needed, irrespective of which oscillator is employed.

3. External frequency standards

House standards or other frequency standards can be used instead of the internal 10 MHz oscillator.
If a time resolution of 100 ns is required, 10 MHz must be used. When using 1 MHz instead of 10 MHz the decimal point must be shifted one step to the left to interpret the display correctly. To set the counter to external standard the switch EXT. STD OUT VIA D/EXT. STD IN VIA D at the rear panel must be set to position EXT. STD IN VIA D.

4. Control settings

4.1. A, B and C inputs

The A and B amplifiers are identical in specification and provided with identical input controls.
The A input is normally used for frequency measurement and the B input for time measurement.
The C input is a prescaler input with automatic PIN-diode attenuator and mainly used for high frequency measurement.

4.2. AC and DC coupling

The AC/DC push-button controls the coupling of the input signal to the attenuator and the amplifier by switching a capacitor in series in the AC mode and by direct coupling in the DC mode.
A.C. coupling is normally used to block the d.c. component in signals which are superimposed on a d.c. voltage. The capacitor in series will, however, cause a falling sensitivity for low frequencies.
In waveforms where pulse width and repetition time vary the d.c. level will also vary. Change in the d.c. level will cause changes in the preset triggering level and make accurate time measurements impossible if A.C. coupled, in such cases the input should be D.C. coupled.
Normally frequency measurements are performed with an A.C. coupled input and time interval measurements with a D.C. coupled input.

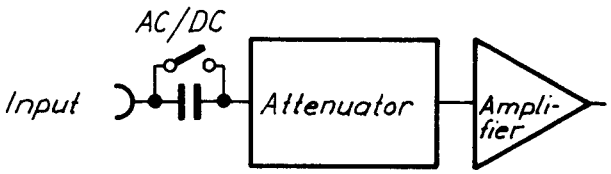


Fig. VI-1. AC/DC coupling

4.3. Attenuator and Trigger Level.

The TRIGGER LEVEL control allows continuous setting of the trigger level at any point of the input signal. For high amplitude signals the attenuator is used to expand the setting range.
However, input attenuation will decrease the sensitivity and cause bigger trigger errors.
For frequency measurements on sine wave and other symmetrical signals no level off-set is required. Pulled position of the TRIGGER LEVEL control sets the trigger level to 0 V for highest sensitivity.
However, for frequency measurement on narrow pulses a limited off-set voltage may be needed to obtain reliable triggering.
Time measurement requires continuously variable setting of the trigger level.
Monitor sockets for channel A and B provide the ability to measure the set trigger level.
If the attenuator is set to 200 mV the trigger level range is increased 10 times from ±2.5 V to ±25 V.

The name trigger level can be misleading, since triggering does not occur on the set trigger level but at the trigger point—see figure VI-2.

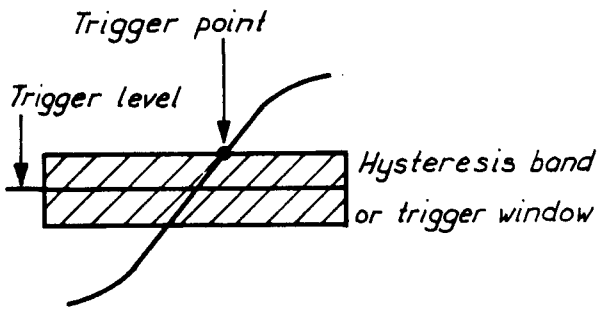


Fig. VI-2. Triggering

4.4. Separate and Common via B mode

In the SEP position the A and B inputs operate independently of each other in any operations irrespective of input sources. In the COM position the A input is disconnected from its attenuator and amplifier, and a signal connected to input B is coupled to both A and B attenuators and amplifiers.
All input specifications of input B will remain the same but the input impedance will be 500 kΩ shunted by 50 pF.

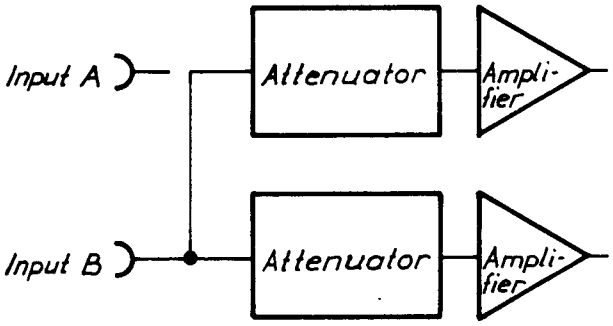


Fig. VI-3. COM via B mode

4.5. Positive and negative slope triggering
This push-button determines on which slope of the input signal the triggering will occur.
In released position the triggering will occur at the positive slope of the input signal and in depressed position it will occur on the negative slope.
Where on the slope the triggering will occur is determined by the TRIGGER LEVEL control.

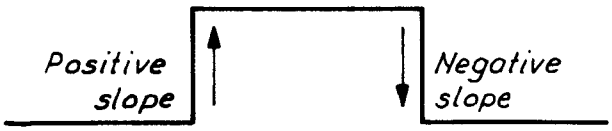


Fig. VI-4. Positive and negative slope triggering

A simple way to measure the pulse width of a positive pulse is achieved by setting input A to positive slope and input B to negative slope, connect the pulse to input B, set FUNCTION SELECTOR to any of the two SINGLE positions, slide switch PERIOD B/TIME INT. A TO B to position TIME INT. A TO B and SEP/COM to COM.

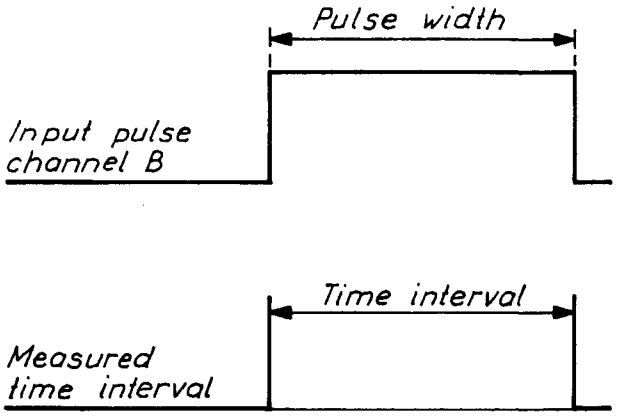


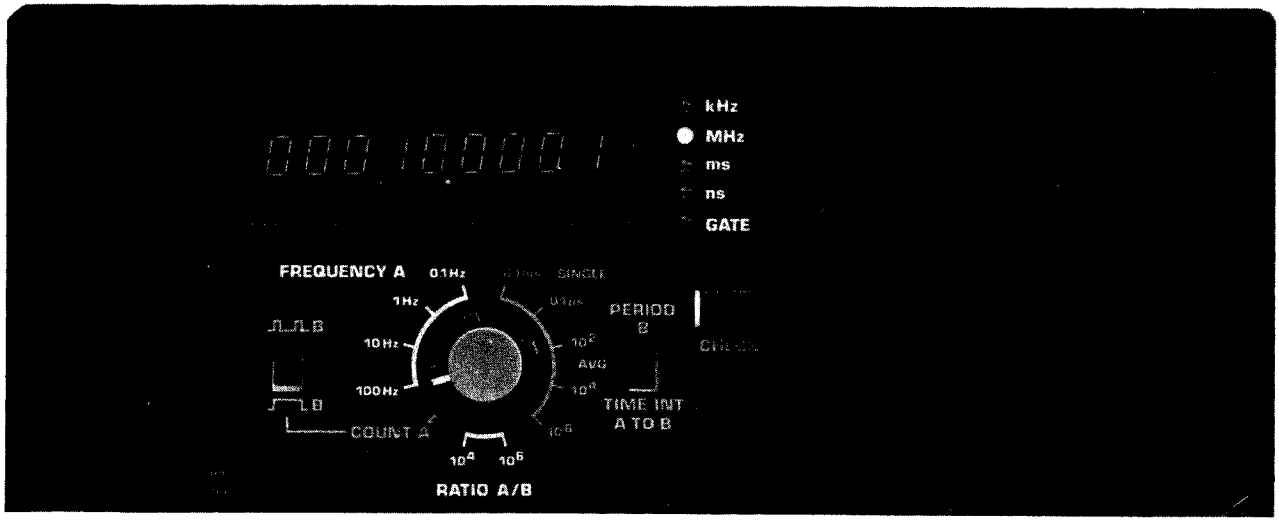
Fig. VI-5. Simple pulse width measurement

4.6. Hold off PM 6622

This control provides a delayed triggering of the instrument in single period and time interval measurement, this feature is used to avoid false triggering on noisy signals.

5. Basic measurements

5.1. CHECK PM 6622



Self check of the instrument.

— Depress CHECK push-button

— Rotate FUNCTION SELECTOR and read:

Frequency A

100 Hz	00010.0000
10 Hz	0010.00000
1 Hz	010.000000
0.1 Hz	10.0000000

— Set PERIOD B/TIME INT A TO B to PERIOD B

Period B

0.1 ms	00000000.0
0.1 ns	00000.0001
10^2	000000100
10^4	0000100.00
10^6	00100.0000

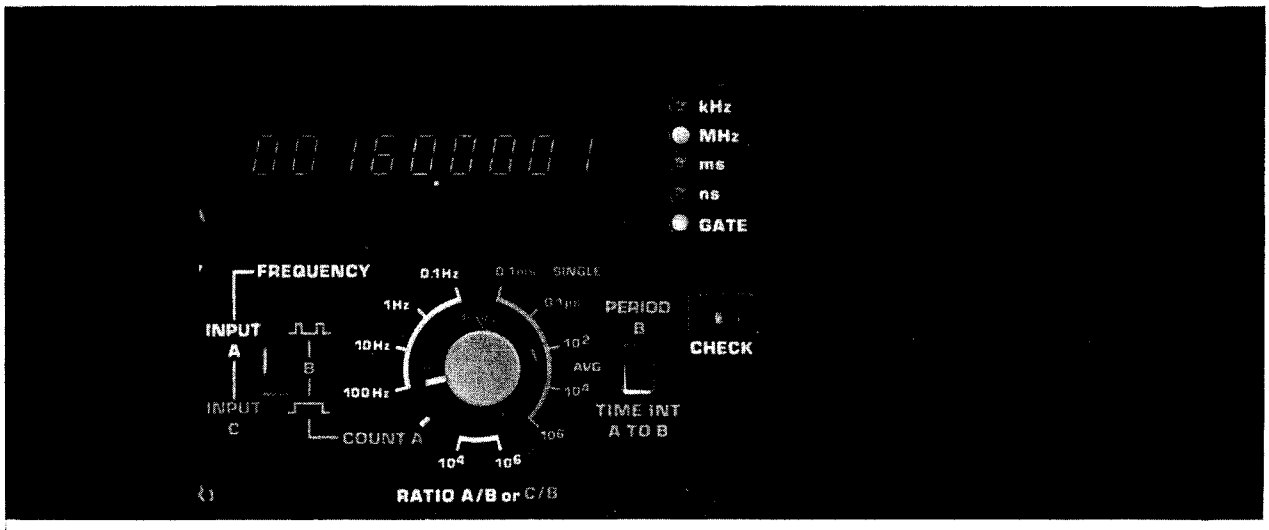
Ratio A/B

10^6	001.000000
10^4	00001.0000

Count A

Start/Stop	000000002
Gated	000000001

5.2. CHECK PM 6624 . . . 25



Self check of the instrument.

— Depress CHECK push-button
— Set INPUT A/INPUT C to INPUT A
— Rotate FUNCTION SELECTOR and read:

FREQUENCY A

100 Hz	00010.0000 MHz
10 Hz	0010.00000 MHz
1 Hz	010000.000 kHz
0.1 Hz	10000.0000 kHz

— Set PERIOD B/TIME INT A TO B to PERIOD B

PERIOD B

0.1 ms	00000000.0
0.1 ns	00000.0001
10^2	000000100
10^4	0000100.00
10^6	00100.0000

RATIO A/B

10^6	001.000000
10^4	00001.0000

— Set INPUT A/INPUT C to INPUT C

RATIO C/B PM 6624

10^4	008.000000
10^6	00008.0000

RATIO C/B PM 6625

10^4	016.000000
10^6	00016.0000

COUNT A

Start/Stop	000000002
Gated	000000001

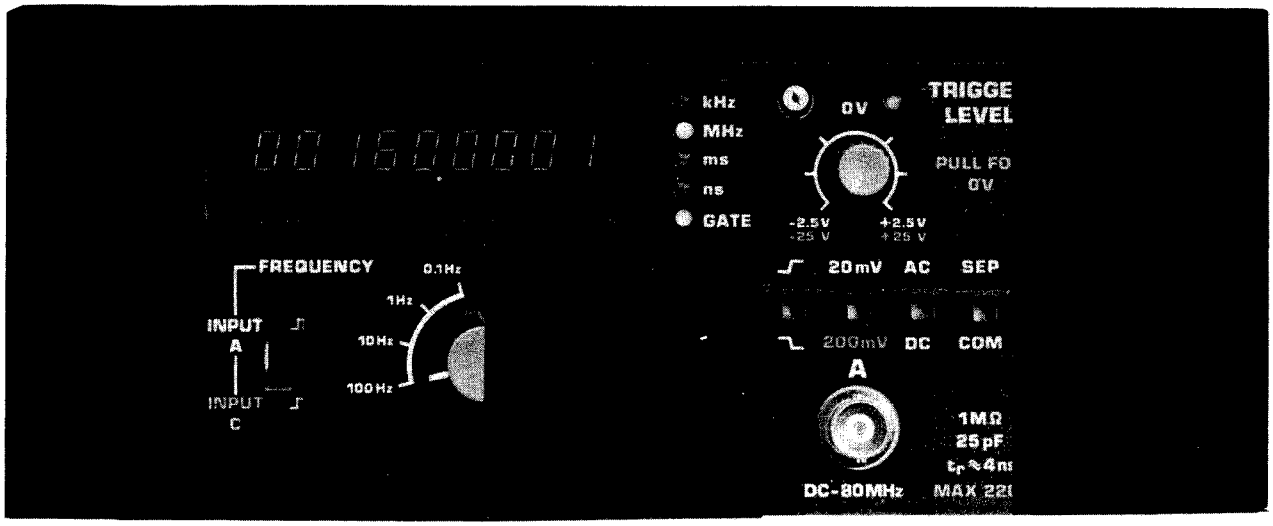
FREQUENCY C PM 6624

100 Hz	00080.0000 MHz
10 Hz	0080.00000 MHz
1 Hz	080000.000 kHz
0.1 Hz	80000.0000 kHz

FREQUENCY C PM 6625

100 Hz	00160.0000 MHz
10 Hz	0160.00000 MHz
1 Hz	160000.000 kHz
0.1 Hz	60000.0000 kHz

5.3. Frequency A. PM 6622 . . . 25

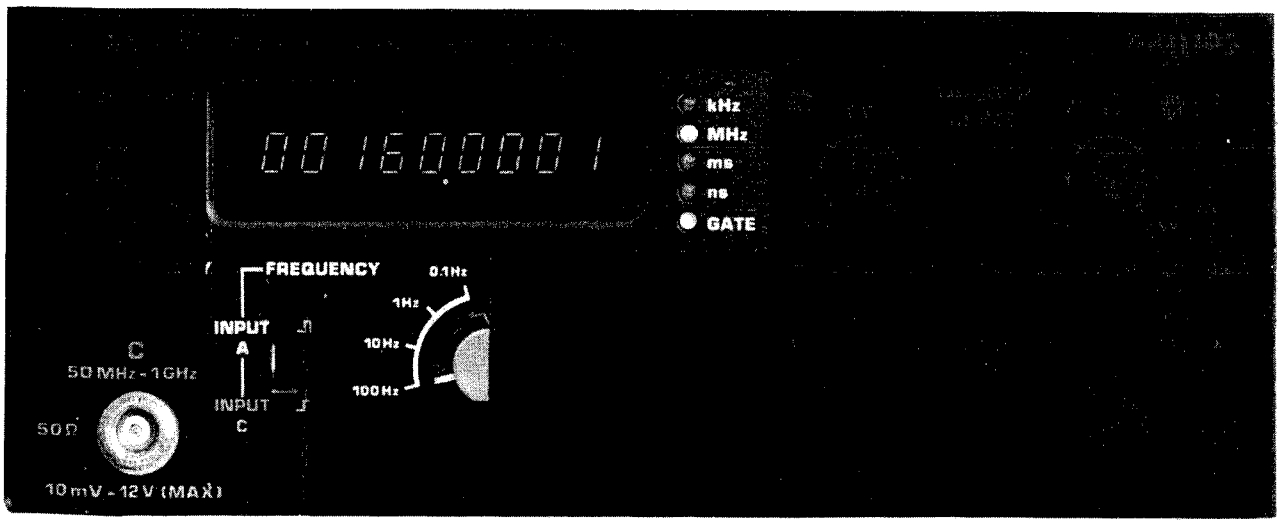


Simple frequency measurement on sine waves and other symmetrical waveforms.

— Set FUNCTION SELECTOR to desired resolution
— Set INPUT A/INPUT C to INPUT A (only PM 6624 . . . 25)
— Set AC/DC to AC
— Pull TRIGGER LEVEL control
— Set SEP/COM to SEP
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
— Connect the input signal to input A

Display will show frequency in kHz or MHz

5.4. FREQUENCY C PM 6624 . . . 25

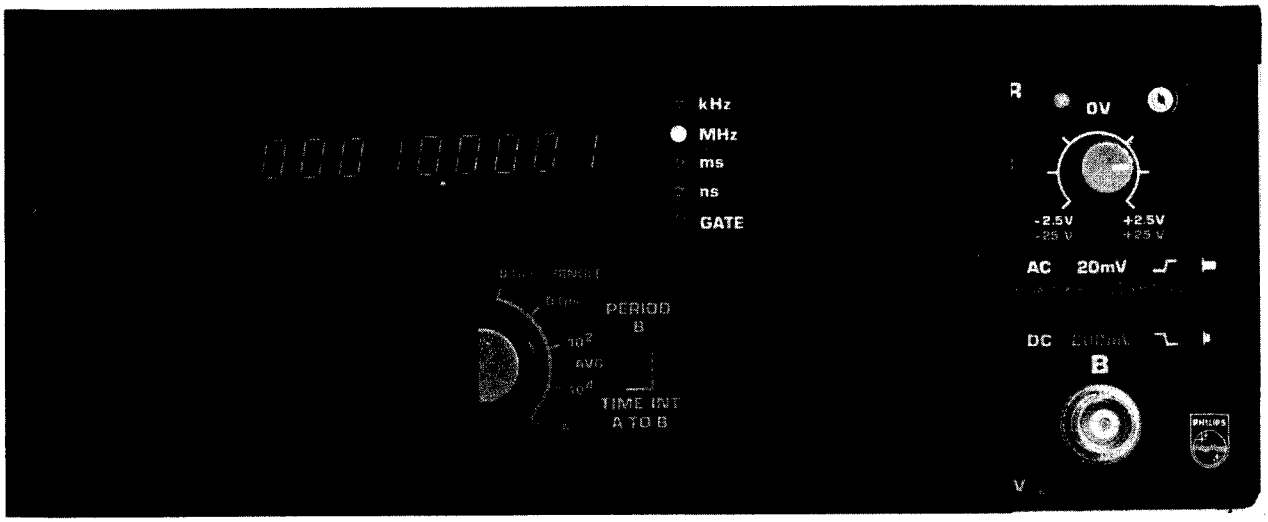


Automatic frequency measurement.

— Set FUNCTION SELECTOR to desired resolution
— Set INPUT A/INPUT C to INPUT C
— Connect the input signal to input C

Display will show frequency in MHz or kHz

5.5. PERIOD B PM 6622 . . . 25



Simple period measurement on sine waves and other symmetrical waveforms.

— Set FUNCTION SELECTOR to SINGLE or AVG measurement
— Set PERIOD B/TIME INT A TO B to PERIOD B
— Pull TRIGGER LEVEL
— Set AC/DC to AC
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
— Select positive slope triggering
— Connect the signal to input B

Display will show period time in ms or ns

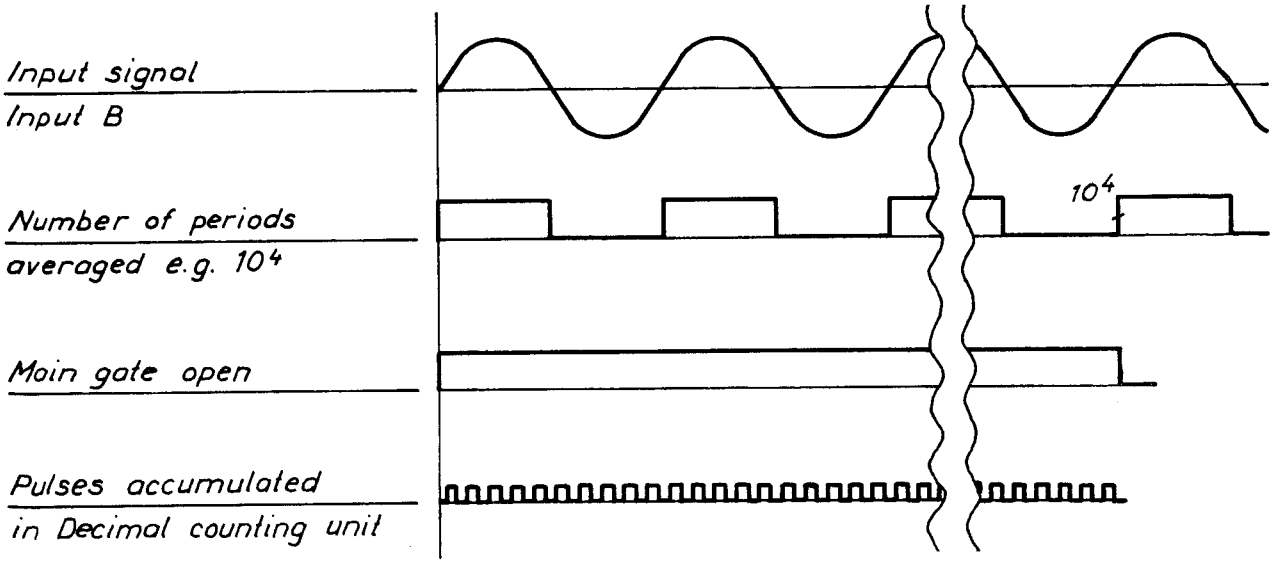


Fig. VI-6. Period average measurement

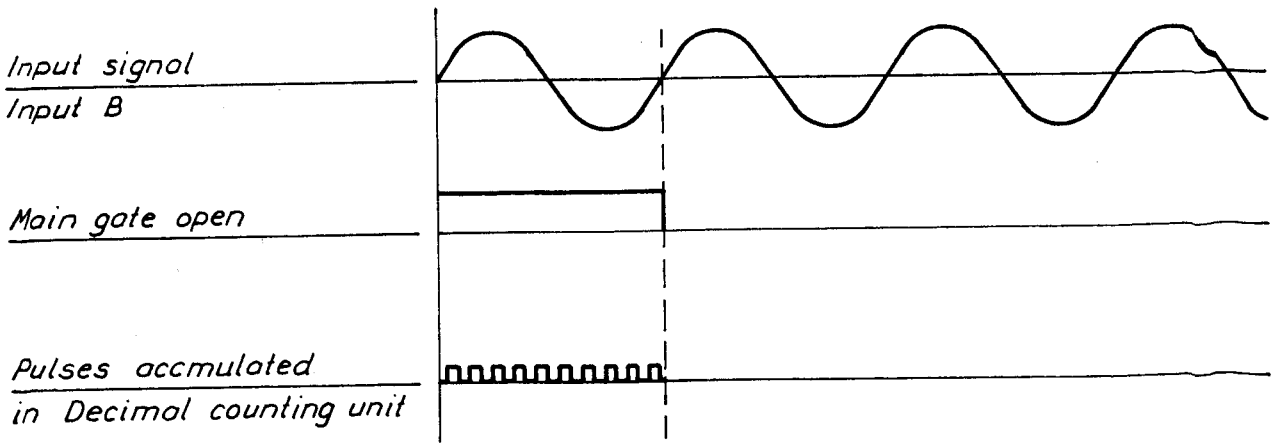
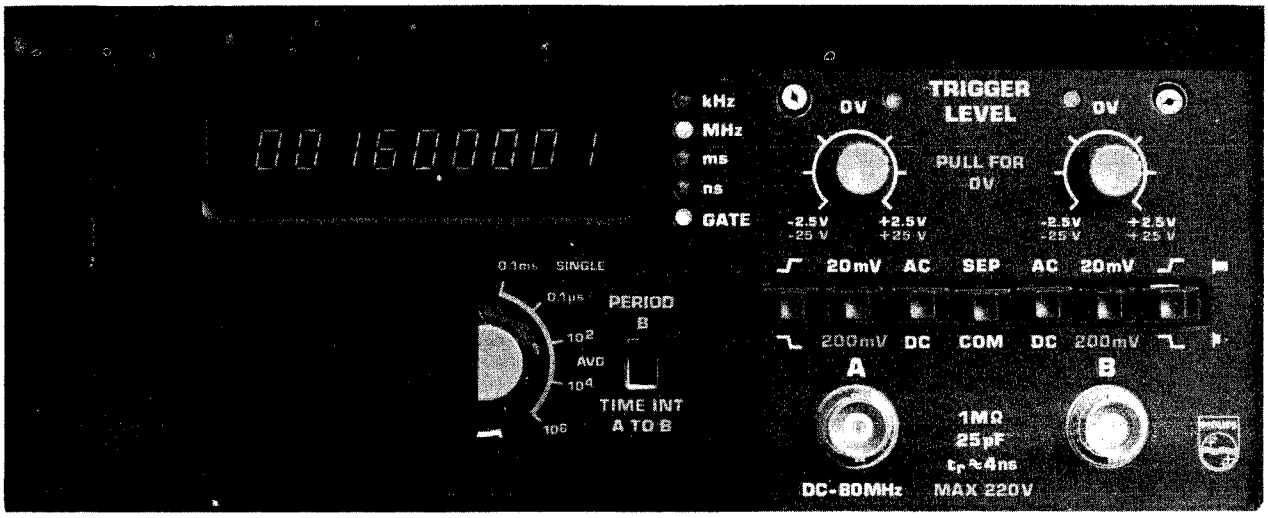


Fig. VI-7. Single period measurement

5.6. Time Interval A to B PM 6622 . . . 25



Simple measurement of time interval between pulses at input A and B from separate sources.

— Set FUNCTION SELECTOR to SINGLE or AVG

— Set PERIOD B/TIME INT A TO B to TIME INT A TO B

— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 3 $V_{p\text{-}p}$

— Set AC/DC to DC

— Set SEP/COM to SEP

— Select positive slope triggering

— Set TRIGGER LEVEL potentiometer to suitable trigger level e.g. 50 % of the pulse amplitude

— Connect the pulses to input A and B

Display will show the time interval in ms or ns

5.7. Ratio A/B PM 6622 . . . 25

Simple ratio measurement on sine wave or other symmetrical waveforms.

— Set FUNCTION SELECTOR to 10^4 or 10^6

— Pull TRIGGER LEVEL control

— Set AC/DC to AC

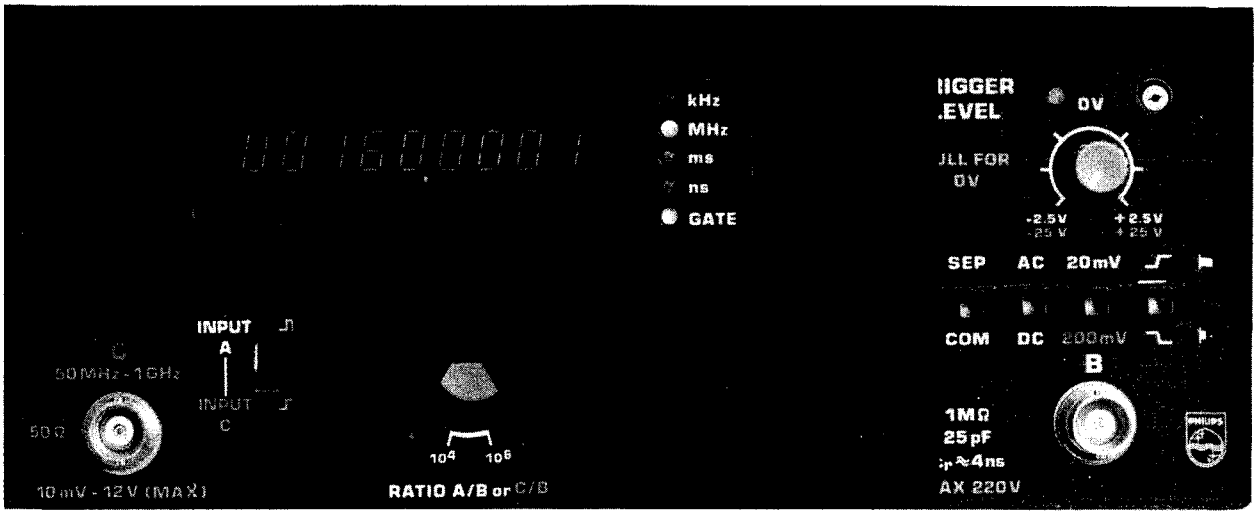
— Set SEP/COM to SEP

— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}

— Connect the signal with the highest frequency to input A and the other signal to input B

Display will show the ratio of the signal frequencies at input A and B

5.8. Ratio C/B PM 6624 . . . 25



Simple ratio measurement on sine wave and other symmetrical waveforms.

— Set FUNCTION SELECTOR to 10^4 or 10^6

— Set INPUT A/INPUT C to INPUT C

— Pull TRIGGER LEVEL control

— Set SEP/COM to SEP

— Set AC/DC to AC

— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}

— Connect the signal with the highest frequency to input C and the other to input B

Display will show the ratio of the signal frequencies at input C and B

5.9. Count A Start/Stop and Gated by B. PM 6622 . . . 25

Simple Start/Stop and Gated by B measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to COUNT A
- Pull TRIGGER LEVEL Control
- Set AC/DC to AC for channel A
- Set AC/DC to DC for channel B
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
- Select positive slope triggering
- Select Start/Stop by B (upper position) or Gated by B (lower position)
- Connect gating signal to input B and the other signal to input A

In Start/Stop operation the display will show the accumulated number of counts in the time interval between the Start/Stop signals, and in the Gated mode the accumulated number of counts during the positive and negative slopes of the Gating signal

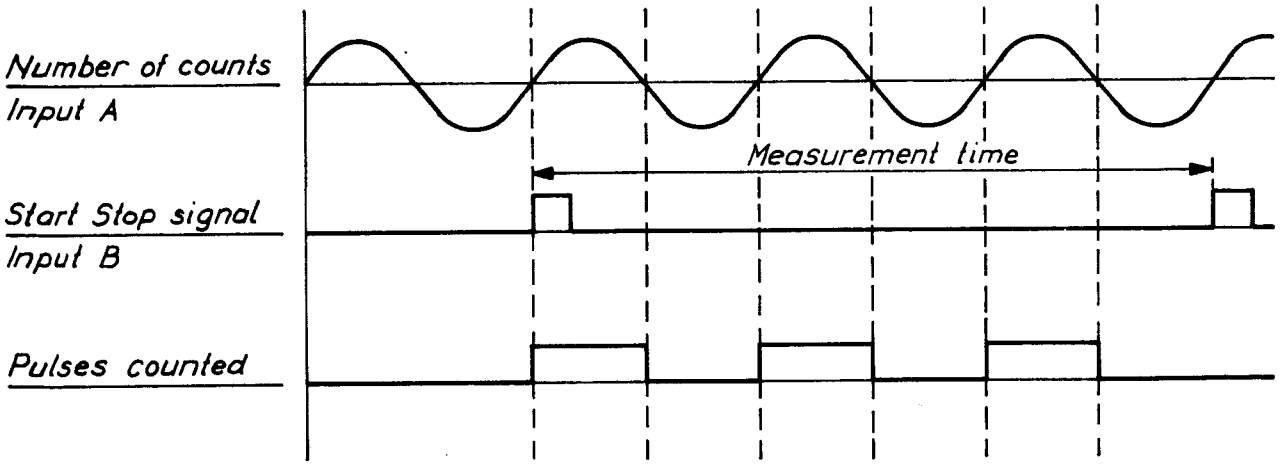


Fig. VI-8. Start/Stop by B measurement

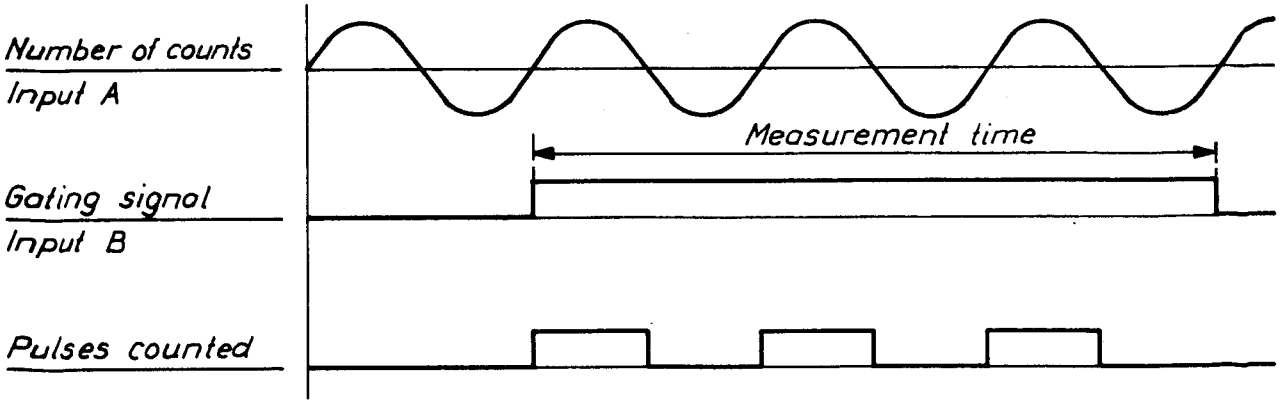
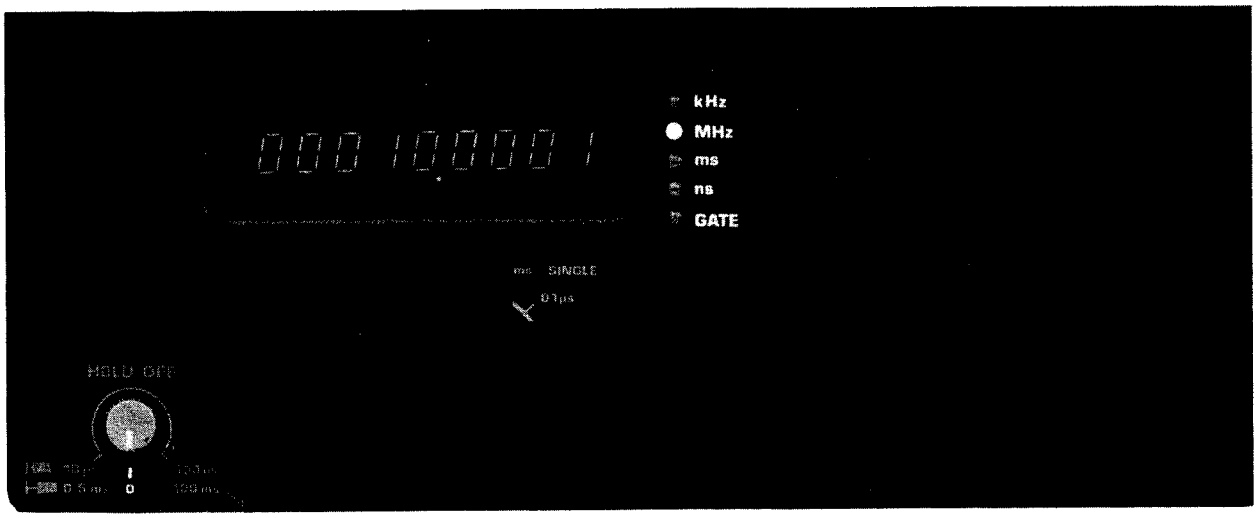


Fig. VI-9. Gated by B measurement

5.10. Hold off PM 6622



— Set FUNCTION SELECTOR to 0.1 µs and rotate HOLD OFF control from fully CCW to fully CW position

— Read hold off time from 0.01 to 0.5 ms on the display with knob pushed and 0.5 ms to 100 ms with knob pulled

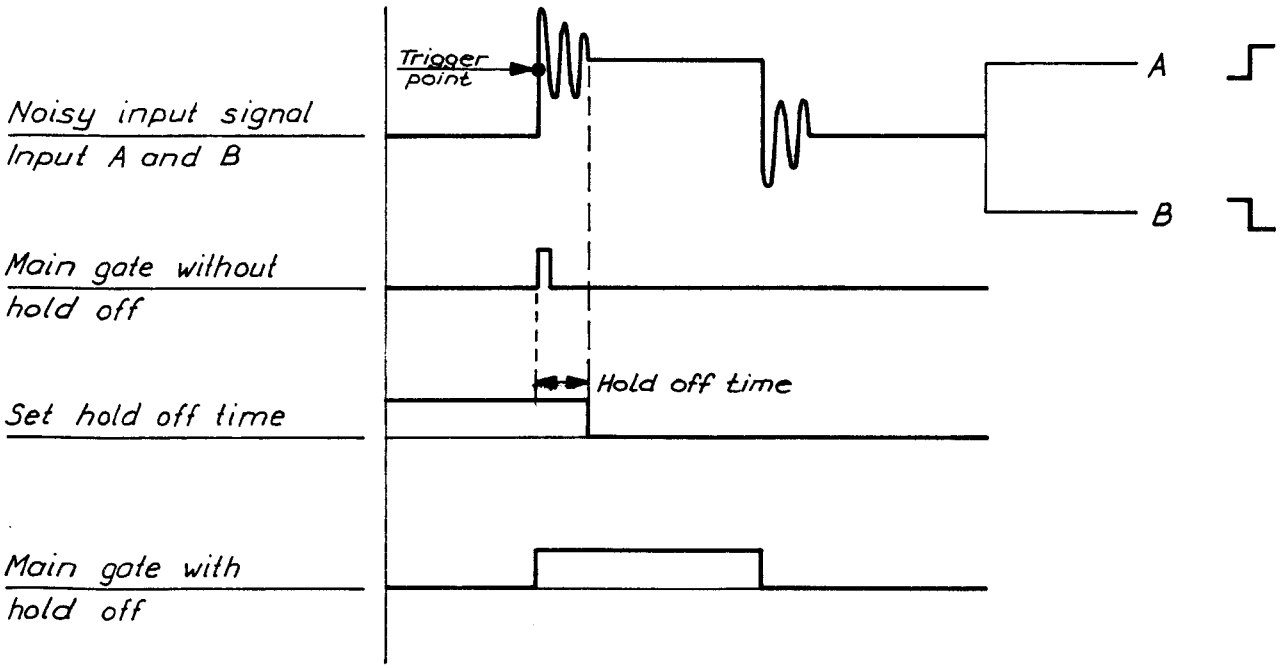


Fig. VI-10. Time interval measurement on noisy signals

VII. INTERNAL CHECKS AND ADJUSTMENTS

The tolerances mentioned in the following text apply to newly adjusted instruments only. The value may differ from those given in Chapter II Technical data.

Note: Always check the d.c. supply voltages before any adjustments are made.

1. Use figure X-2 to identify the location of trimmers and check points.

2. Test equipment

Check point	*Instrument*	*Required data*	*Recommended model*
3	Voltmeter	5—150 V d.c.	Philips PM 2412
4 6	Voltmeter	1 V d.c.	Philips PM 2412
5 8	Pulsegenerator	Frequency 10 kHz Amplitude 1 V Duty factor 0.5	Philips PM 5715 or PM 5705
5 8	Oscilloscope	Low frequency	Philips PM 3250
5 8	Probe	Passive 10 MΩ/11 pF	Philips PM 9336

3. D.C. voltages

3.1 Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

Test point	*Measured voltage*
+120	115 . . . 130 V
+5.2	4.8 . . . 5.2 V
+12	11.5 . . . 13 V
—5.2	—5 . . . —5.4 V
—50	—50 . . . —60 V

4. D.C. balance channel A.

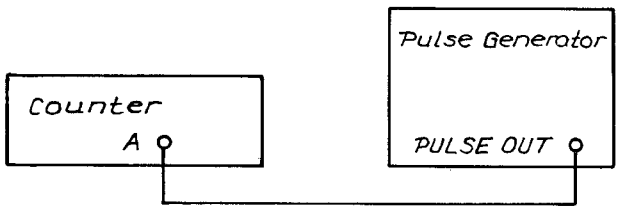
4.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop	upper position
Trigg. level pot.	pulled

4.2 Connect the voltmeter to terminal 6 of IC 101 and adjust R 1104 until voltmeter shows 0 V.

5. Frequency compensation channel A

Test set up.



5.1 Set the controls of the counter:

Attenuator	200 mV position

5.2 Set the controls of the pulse generator:

Frequency	10 kHz
Amplitude	3 $V_{p\text{-}p}$
Duty factor	0.5

5.3 Connect the oscilloscope via a well adjusted 10 MΩ/11 pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the dispayed waveform.

6. D.C. balance channel B

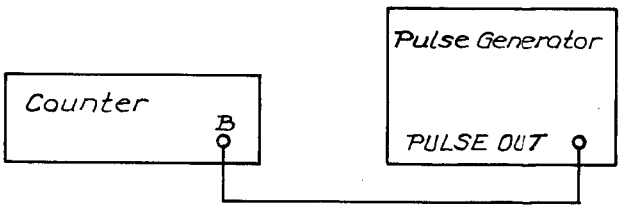
6.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop	upper position
Trigg.level pot.	pulled.

6.2 Connect the voltmeter to terminal 12 of IC 101 and adjust R 1044 until voltmeter shows zero.

7. Frequency compensation channel B

Test set up.



7.1 Set the controls of the counter:

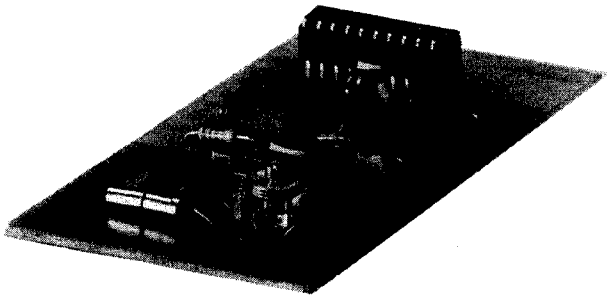
Attenuator	200 mV position

7.2 Set the controls of the pulse generator:

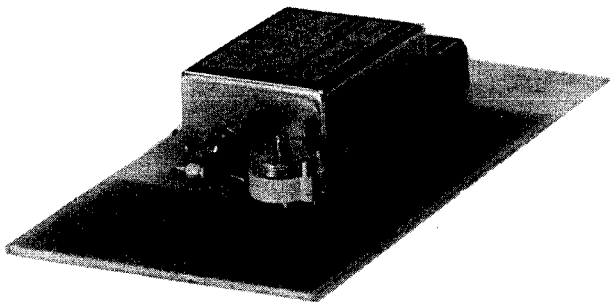
Frequency	10 kHz
Amplitude	3 $V_{p\text{-}p}$
Duty factor	0.5

7.3 Connect the oscilloscope via a well adjusted 10 MΩ/11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed wave form.

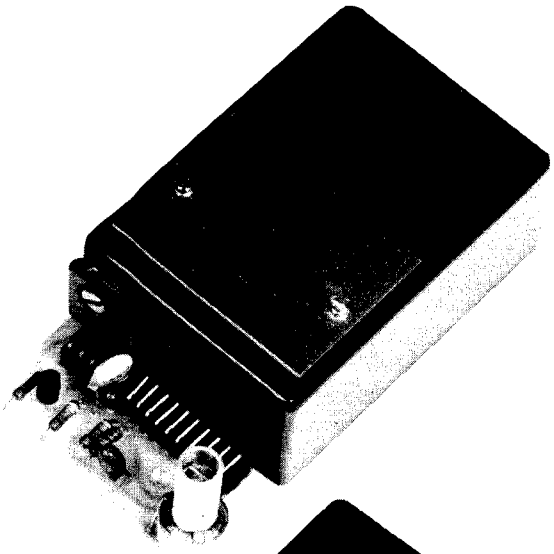
VIII. OSCILLATORS PM 9677, PM 9678, PM 9679 and PM 9690



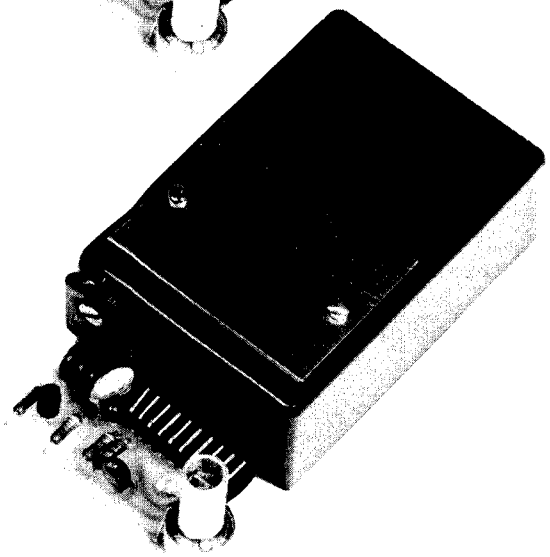
PM 9677
9446 096 770.1



PM 9678
9446 096 780.1



PM 9679
9446 096 790.1



PM 9690
9446 096 900.1

1. General

The oscillators are made as plug-in cards and have a nominal frequency of 10 MHz.

2. Technical data

2.1. Electrical	*PM 9677*	*PM 9678*	*PM 9679*	*PM 9690*
Nominal frequency, MHz	10.000 000	10.000 000	10.000 000	10.000 000
Trimming range, Hz	> ± 200	> ± 20	+20*) —30	+3*) —7
Output voltage, mV (into 1 kohm)	> 300	> 100	> 150	> 50
Supply voltage, V	+ 12	+ 12	+ 11.5 to 28 (from unregulated power supply)	+ 11.5 to 28 (from unregulated power supply)
Power consumption (+25°C)				
Continuous operation	< 100 mW	< 200 mW	< 100 mA	< 125 mA
Stand by	none	none	< 100 mA	< 125 mA
Warm up	none	none	< 400 mA	< 400 mA
Stability against:				
Ageing	$< 5\times10^{-7}$/month	$< 1\times10^{-7}$/month**)	$< 1\times10^{-7}$/month	$< 1.5\times10^{-9}$/24 h (after 72 hours of continuous operation)
Temperature 0...50°C (ref. to +25°C)	$< 1\times10^{-5}$	$< 1\times10^{-6}$	$< 1\times10^{-7}$	$< 3\times10^{-8}$
Line voltage ± 10 %	$< 1\times10^{-8}$	$< 1\times10^{-9}$	$< 1\times10^{-9}$	$< 5\times10^{-10}$
Change of measuring mode and change between line, ext. and int. battery	$< 3\times10^{-7}$	$< 5\times10^{-8}$	$< 1\times10^{-8}$	$<3\times10^{-9}$
Warm up time (to reach 1×10^{-7})			< 10 min	< 15 min

2.2. Environmental				
Temperature				
Storage, °C	—40 to +70	—40 to +70	—40 to +70	—40 to +70
Operating, °C	0 to +50	0 to +50	0 to +50	0 to +50
Altitude				
Storage, m	15000	15000	15000	15000
Operating, m	5000	5000	5000	5000
Humidity at 50°C	10—90 % RH (26° dew point)	10—90 % RH (26° dew point)	10—90 % RH (26° dew point)	10—90 % (26° dew point)
Shock	Meets the requirement of the IEC Eb recommendations } all oscillators			
Vibration	Meets the requirement of the IEC 68F recommendations }			

2.3. Mechanical				
Dimensions, mm	93×50×20	93×50×15	100×52×35	100×52×35
Weight, g	50	25	100	100

*) The indicated values regard only the fine trimming range. A coarse trimmer is available on the PM 9679 and PM 9690 to adjust for an ageing of more than 10 years.

**) Trimming range will cover at least 10 years of operation since the ageing will decrease substantially after the first 6 months.

3. Frequency adjustment PM 9677

3.1. This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-6}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of +25°C.
3.2. Remove the bottom cover of the counter.
3.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
3.4. Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled
3.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 10 Hz.

4. Frequency adjustment PM 9678

4.1. This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-7}$.
The oven enclosed PHILIPS oscillator PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of +25°C.
4.2. Remove the bottom cover of the counter.
4.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
4.4. Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL: pulled
4.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 1 Hz.
4.6. Set FUNCTION SELECTOR to position 0.1 Hz and check that display read out is the same as before. If not, adjust C1 slightly to correct frequency.

5. Frequency adjustment PM 9679

5.1. This adjustment requires a reference oscillator having an accuracy of $\leq 3 \times 10^{-8}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.
5.2. Remove the bottom cover of the counter.
5.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.
5.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.
5.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div./3 s (0.3 Hz).
If the adjustment range of R 208 is too narrow perform the following steps 5.6 to 5.12.
5.6. Set trimming potentiometer R 208 to fully clockwise position.
5.7. Remove the two screws fixing the oscillator's text plate to the box.
5.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.
5.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.
5.10. Adjust trimming capacitor C 108 until the display read out of the external counter is 10000020 Hz.
5.11. Refit the plastic cylinder and the text plate.
5.12. Perform steps 5.3 to 5.5.

6. Frequency adjustment PM 9690

6.1. This adjustment requires a reference frequency having an accuracy of $\leq 1 \times 10^{-9}$.
Hewlett-Packard quartz frequency standard HP 105* meets this requirement.
The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.
6.2. Remove the bottom cover of the counter.
6.3. Connect any of the three reference signals available at sockets 5 MHz, 1 MHz and 100 kHz of the HP 105 to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.
6.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.
6.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div/10 s (0.1 Hz).
If the adjustment range of R 208 is too narrow perform the following steps 6.6 to 6.12.
6.6. Set trimming potentiometer R 208 to fully clockwise position.
6.7. Remove the two screws fixing the oscillator's text plate to the box.
6.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.
6.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.
6.10. Adjust trimming capacitor C 108 until the display read out of the external counter is 10000003 Hz.
6.11. Refit the plastic cylinder and the text plate.
6.12. Perform steps 6.3 to 6.5.

7. Repair of oscillator PM 9679 and PM 9690

7.1. Repair of these oscillators may not be carried out by the local service organisations. In case of breakdown the complete sealed osciliator box has to be sent to the factory for repair.

Factory address:

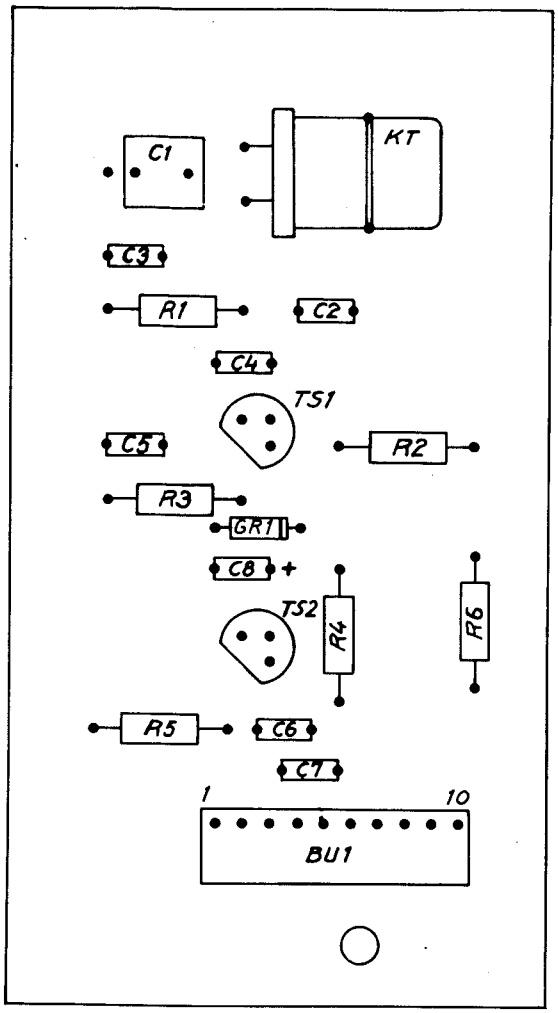
PHILIPS ELEKTRONIKINDUSTRIER AB
INDUSTRIAL OPERATIONS
FACK
S-175 20 JÄRFÄLLA
SWEDEN

8. Pin configuration

Pin	PM 9677	PM 9678	PM 9679	PM 9690
1	⊥	⊥	⊥	⊥
2	⊥	⊥	⊥	⊥
3	⊥	⊥	⊥	⊥
4			+ 11.5 to 28 V	+ 11.5 to 28 V
5	10 MHz out	10 MHz out	10 MHz out	10 MHz out
7	+ 12 V	+ 12 V		

*To be checked against a frequency standard such as Droitwich or HBG.

9. Circuit diagram, component lay-out and spare parts list PM 9677



			RESISTORS	
4822	110	63161	100K 5 CR25	R1
4822	110	63116	2.2K 5 CR25	R2
4822	110	63107	1K 5 CR25	R3
4822	110	63107	1K 5 CR25	R4
4822	110	63107	1K 5 CR25	R5
4822	110	63107	1K 5 CR25	R6
			CAPACITORS	
5322	125	54029	2-18P 300	C1
4822	122	31063	22P 2 100	C2
4822	122	31072	47P 2 100	C3
4822	122	31076	68P 2 100	C4
5322	122	34041	10N -20+50 100	C5
5322	122	34041	10N -20+50 100	C6
5322	122	34041	10N -20+50 100	C7
5322	124	14036	15M -10+50 16	C8
			SEMI CONDUCTORS	
5322	130	44418	BF 256 A	TS1
5322	130	44418	BF 256 A	TS2
5322	130	30766	BZX79-C6V2	GR1
			MISCELLANEOUS	
5322	242	74036	CRYSTAL 10MHZ	
5322	267	64031	CONNECTOR	BU1

Spare parts PM 9677

Figure VIII-1. Component lay-out PM 9677

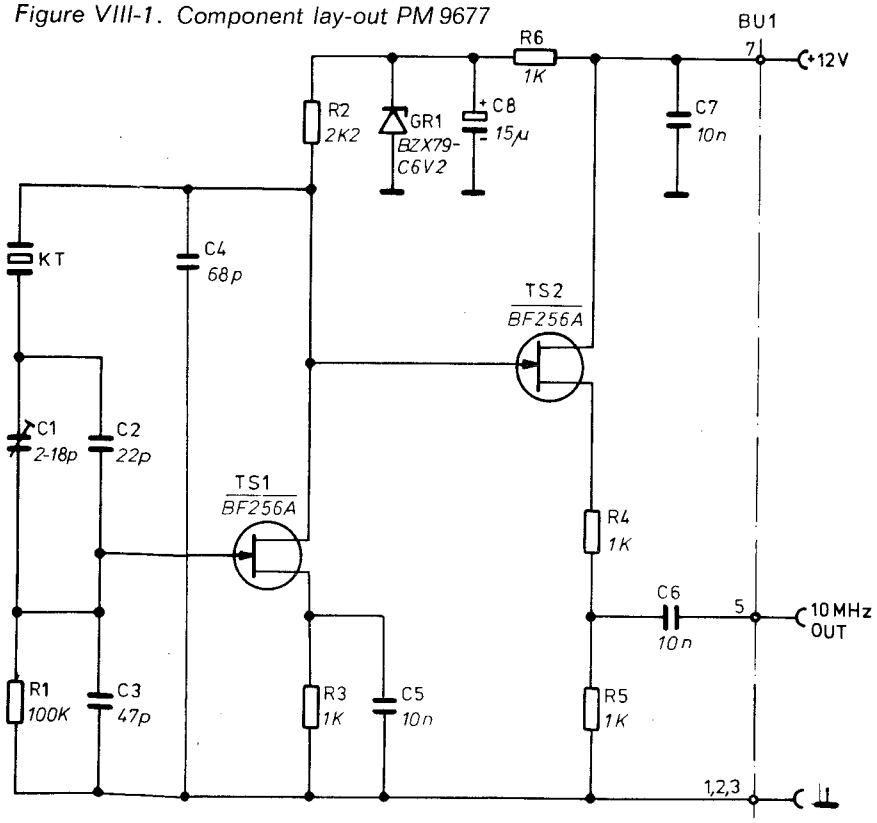


Figure VIII-2. Circuit diagram PM 9677

10. Circuit diagram, component lay-out and spare parts list PM 9678

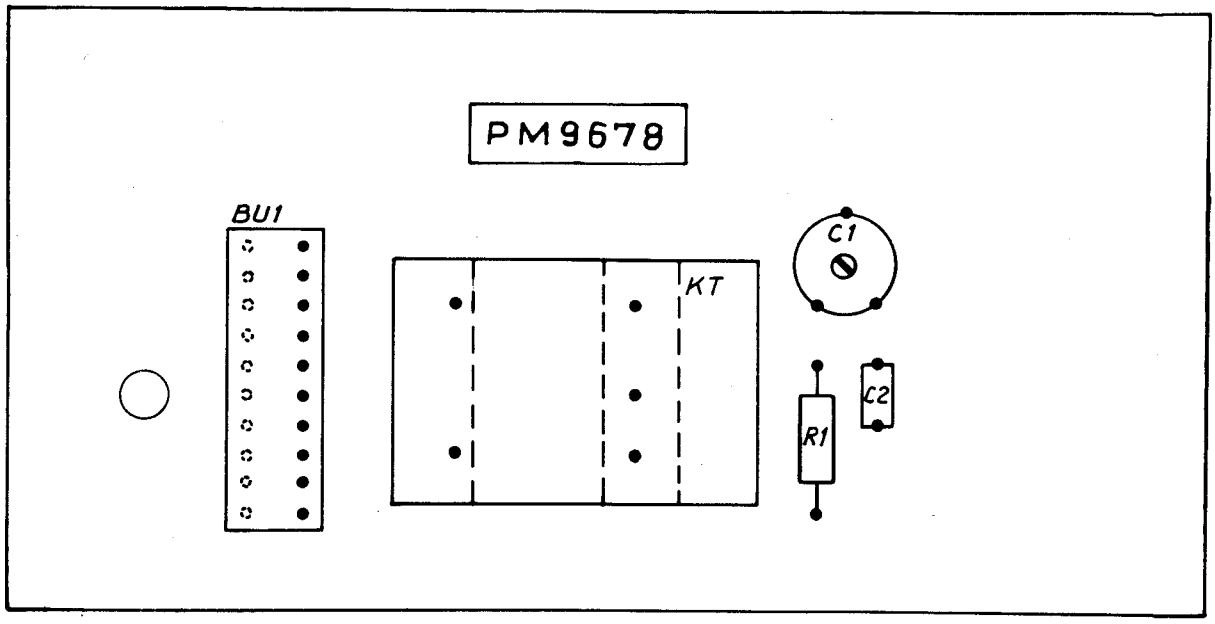


Figure VIII-3. Component lay-out PM 9678

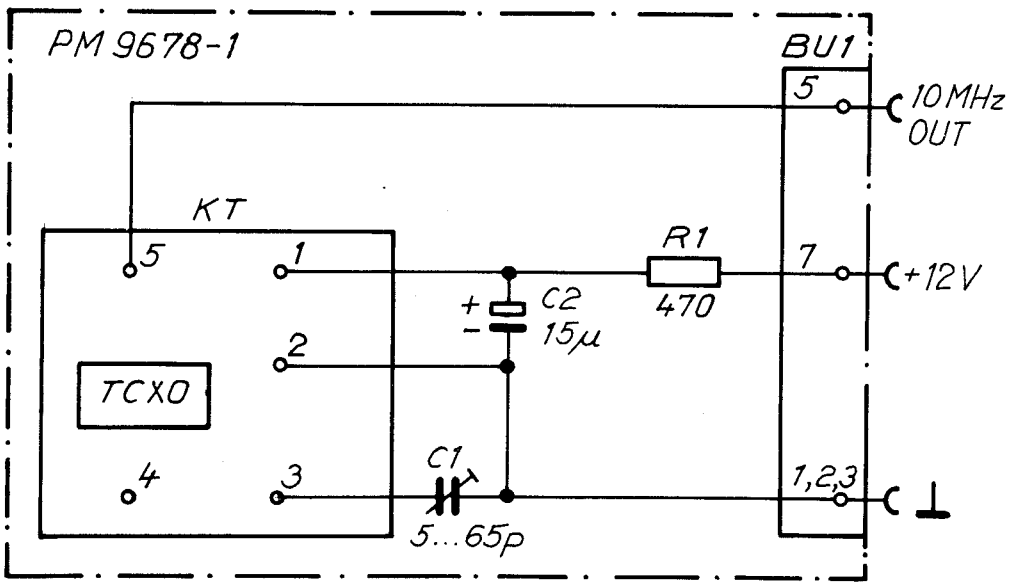


Figure VIII-4. Circuit diagram PM 9678

ORDERING NUMBER

4822 110 63098	470 Ω 5 %		R 1
5322 125 50057	5–65 P	100 V	C 1
5322 124 14036	15 M −10 +50 %	16 V	C 2
5322 267 64031	Connector		BU 1
5322 216 94047	Crystal 10 MHz		

IX. REPLACING PARTS

1. Push-button switches

1.1. Loosen switch by bending the four tags securing the switch to the switch bracket.

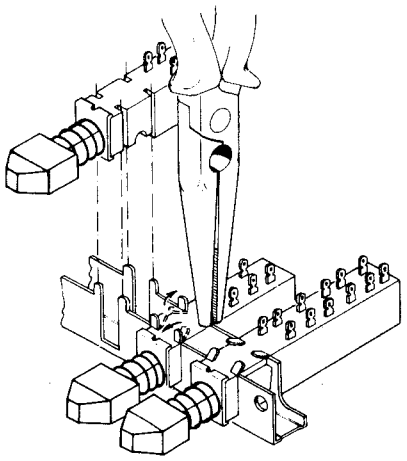


Fig. IX-1. Replacing push-button switch

1.2. Crush the switch by means of a pair of cutting pliers.

1.3. Unsolder the contact pins from the circuit board one by one. Use a sucking device to remove all tin solder from the contact holes in the circuit board before attaching the new switch.

2. Text plate and front rim

2.1. Remove the knobs for DISPLAY TIME, HOLD OFF (PM 6622), TRIGGER LEVEL and function selector.

2.2. Put a screw driver between the front rim and the front frame at points A.

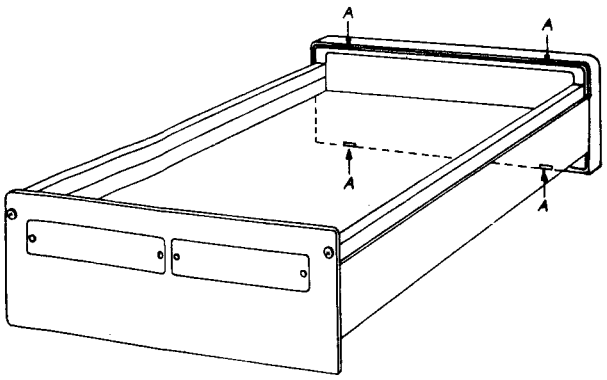


Fig. IX-2. Removing the front rim

2.3. Pry gently until front rim comes off.

2.4. Remove the text plate.

3. Handle

3.1. Remove the two plastic caps using a tiny screw driver or a pair of pliers.

3.2. Unscrew the two screws and pull out handle.

3.3. Before assambling grease, the tooth washer screwhole and teeth of the handle *very slightly* with vaseline.

4. Power supply

When replacing parts in the power supply, in particular IC150, always check the +5,0 V supply.

Proceed as follows:

4.1. Connect a voltmeter to BU107 pin +5,2 V and check that the voltage is 4.8—5.2 V
If the measured voltage does not reach 4.8—5.2 V unsolder R 1103 and select a resistor value that gives the desired voltage. The value of this resistor may be 1 kΩ to 33 kΩ. Typical value is 8 kΩ.

4.2. Check the d.c. voltages, refer to chapter VII section 3.

X. SPARE PARTS. CIRCUIT DESCRIPTION OF POWER SUPPLY AND PRESCALER UNITS. TEST CONDITIONS AND CIRCUIT DIAGRAMS

UNIT U1 ALL MODELS
FIXED RESISTORS

Ordering number	Ohm	Tol(%)	Type	Item
4822 110 63214	10M	10	CR25	R1003
4822 110 63189	1.2M	10	CR25	R1004
4822 110 63189	1.2M	10	CR25	R1005
4822 110 63154	56	5	CR25	R1006
5322 116 54984	68	5	PR37	R1007
4822 110 63165	150K	5	CR25	R1008
4822 110 63134	10K	5	CR25	R1009
4822 110 63134	10K	5	CR25	R1010
4822 110 63081	100	5	CR25	R1011
4822 110 60006	390	5	CR25	R1012
4822 110 63094	330	5	CR25	R1013
4822 110 63116	2.2K	5	CR25	R1017
4822 110 63092	270	5	CR25	R1018
4822 110 63087	180	5	CR25	R1019
4822 110 63107	1.0K	5	CR25	R1020
4822 110 63098	470	5	CR25	R1021
4822 110 63098	470	5	CR25	R1022
4822 110 63134	10K	5	CR25	R1023
4822 110 63109	1.2K	5	CR25	R1024
4822 110 63089	220	5	CR25	R1025
4822 110 63132	8.2K	5	CR25	R1026
4822 110 63098	470	5	CR25	R1028
4822 110 63098	470	5	CR25	R1029
4822 110 63121	3.3K	5	CR25	R1030
4822 110 63214	10M	10	CR25	R1033
4822 110 63189	1.2M	10	CR25	R1034
4822 110 63189	1.2M	10	CR25	R1035
4822 110 63154	56	5	CR25	R1036
5322 116 54984	68	5	PR37	R1037
4822 110 63165	150K	5	CR25	R1038
4822 110 63134	10K	5	CR25	R1039
4822 110 63134	10K	5	CR25	R1040
4822 110 63081	100	5	CR25	R1041
4822 110 60006	390	5	CR25	R1042
4822 110 63094	330	5	CR25	R1043
4822 110 63116	2.2K	5	CR25	R1047
4822 110 63092	270	5	CR25	R1048
4822 110 63087	180	5	CR25	R1049
4822 110 63105	820	5	CR25	R1050
4822 110 63098	470	5	CR25	R1051
4822 110 63098	470	5	CR25	R1052
4822 110 63134	10K	5	CR25	R1053
4822 110 63134	10K	5	CR25	R1054
4822 110 63089	220	5	CR25	R1055
4822 110 63098	470	5	CR25	R1058
4822 110 63098	470	5	CR25	R1059
4822 110 63121	3.3K	5	CR25	R1060
5322 116 50524	3.01K	1	MR25	R1101
5322 116 54011	5.62K	1	MR25	R1102
	SELECTED*		CR25	R1103
4822 110 63107	1.0K	5	CR25	R1104
4822 110 63121	3.3K	5	CR25	R1105
4822 110 63107	1.0K	5	CR25	R1106
4822 110 63107	1K			R1107
4822 110 63109	1.2K	5	CR25	R1108
4822 110 63116	2.2K	5	CR25	R1109
4822 110 63169	220K	5	CR25	R1110
4822 110 63089	220	5	CR25	R1111
4822 110 63063	22	5	CR25	R1112
4822 110 63089	220	5	CR25	R1113
4822 110 63032	1.5	5	CR25	R1114
5322 116 54963	0.18	10		R1115
4822 110 63098	470	5	CR25	R1116
4822 110 63089	220	5	CR25	R1117
4822 110 63072	47	5	CR25	R1118
4822 110 63169	220	5	CR25	R1119
4822 110 63107	1.0K	5	CR25	R1120
4822 110 63098	470	5	CR25	R1121
4822 110 63081	100	5	CR25	R1122
4822 116 30114	4.7K	NTC	NTC	R1123
4822 113 60084	1.0	10		R1124
4822 110 63134	10K	5	CR25	R1127
4822 110 63107	1.0	5	CR25	R1128
4822 110 63107	1.0	5	CR25	R1129
4822 110 63107	1.0	5	CR25	R1130
4822 110 63163	120K	5	CR25	R1131
4822 110 63152	47K	5	CR25	R1132
4822 110 63089	220	5	CR25	R1133
4822 110 63098	470	5	CR25	R1134
4822 110 63098	470	5	CR25	R1135
4822 110 63098	470	5	CR25	R1136
4822 110 63098	470	5	CR25	R1137
4822 110 63152	47K	5	CR25	R1138
4822 110 63125	4.7K	5	CR25	R1139
4822 110 63107	1.0	5	CR25	R1140
4822 110 63107	1.0	5	CR25	R1141
4822 110 63134	10K	5	CR25	R1142
4822 110 63152	47K	5	CR25	R1143
4822 110 63152	47K	5	CR25	R1144
4822 110 63152	47K	5	CR25	R1145
4822 110 63152	47K	5	CR25	R1146
4822 110 63134	10K	5	CR25	R1147
4822 110 63107	1.0	5	CR25	R1150
4822 110 63107	1.0	5	CR25	R1151
4822 110 60006	390	5	CR25	R1152
4822 110 63214	10M	10	CR25	R1153
4822 110 63143	22K	5	CR25	R1154
4822 110 63123	3.9K	5	CR25	R1156
4822 110 63107	1.0	5	CR25	R1157
4822 110 63089	220	5	CR25	R1158
4822 110 63134	10K	5	CR25	R1160
4822 110 63134	10K	5	CR25	R1161
4822 110 63187	1M	5	CR25	R1162
4822 110 63134	10K	5	CR25	R1163
4822 110 63107	1.0	5	CR25	R1164
4822 110 63125	4.7K	5	CR25	R1166
4822 110 63114	1.8K	5	CR25	R1167
4822 110 63114	1.8K	5	CR25	R1168
4822 110 63185	820K	5	CR25	R1170
4822 110 63098	470	5	CR25	R1171
4822 110 63098	470	5	CR25	R1172
4822 110 63114	1.8K	5	CR25	R1173
4822 110 63114	1.8K	5	CR25	R1174
4822 110 63116	2.2K	5	CR25	R1175
4822 110 63125	4.7K	5	CR25	R1176
4822 110 63143	22K	5	CR25	R1177
4822 110 63129	6.8K	5	CR25	R1178
4822 110 63138	15K	5	CR25	R1180
4822 110 63138	15K	5	CR25	R1181
4822 110 63138	15K	5	CR25	R1182
4822 110 63138	15K	5	CR25	R1183
4822 110 63138	15K	5	CR25	R1184
4822 110 63138	15K	5	CR25	R1185
4822 110 63138	15K	5	CR25	R1186
4822 110 63138	15K	5	CR25	R1187
4822 110 63138	15K	5	CR25	R1188
4822 110 63098	470	5	CR25	R1189
4822 110 63116	2.2K	5	CR25	R1190
4822 110 63116	2.2K	5	CR25	R1191
4822 110 63116	2.2K	5	CR25	R1192
4822 110 63116	2.2K	5	CR25	R1193
4822 110 63116	2.2K	5	CR25	R1194
4822 110 63116	2.2K	5	CR25	R1195
4822 110 63116	2.2K	5	CR25	R1196
4822 110 63116	2.2K	5	CR25	R1197

UNIT U1 ALL MODELS
VARIABLE RESISTORS

Ordering number	Ohm	Description		Item
5322 101 14011	100	TRIMM	POTM	R1014
5322 101 64017	47K	SK109		R1015
5322 101 14011	100	TRIMM	POTM	R1044
5322 101 64017	47K	SK119		R1045
5322 101 94007	1M	SK101	SK102	R1165

UNIT U1 ALL MODELS
FIXED CAPACITORS

Ordering number	Farad	Tol.(%)	Volts	Item
4822 121 40407	22N	10	630	C101
4822 122 31076	68P	2	100	C103
4822 122 31168	270P	2	500	C104
4822 122 31072	47P	2	100	C105
5322 122 34041	10N	+20+50	100	C106
5322 121 40323	100N	10	100	C107
5322 124 14053	33M	+10+50	10	C108
4822 121 40407	22N	10	630	C111
4822 122 31076	68P	2	100	C113
4822 122 31168	270P	2	500	C114
4822 122 31072	47P	2	100	C115
5322 122 34041	10N	+20+50	100	C116
5322 121 40323	100N	10	100	C117
5322 124 14053	33M	+10+50	100	C118
4822 122 31081	100P	2	100	C119
5322 124 14053	33M	+10+50	10	C121
5322 122 34041	10N	+20+50	100	C122
5322 124 14053	33M	+10+50	10	C123
5322 122 34041	10N	+20+50	100	C124
5322 122 34041	10N	+20+50	100	C125
5322 122 34041	10N	+20+50	100	C126
5322 122 34041	10N	+20+50	100	C127
5322 122 34041	10N	+20+50	100	C128
5322 122 34041	10N	+20+50	100	C129
4822 121 40407	22N	10	630	C130
4822 122 31036	2.2P	2	100	C131
5322 122 34041	10N	+20+50	100	C132
5322 124 14053	33M	+10+50	10	C133
5322 124 14053	33M	+10+50	10	C134
5322 122 34041	10N	+20+50	100	C136
5322 122 34041	10N	+20+50	100	C137
4822 124 10197	47M	+10+50	6.3	C139
4822 124 10197	47M	+10+50	6.3	C140
4822 121 40232	220N	10	100	C141
5322 122 34041	10N	+20+50	100	C144
4822 122 30113	180P	2	100	C146
5322 122 34041	10N	+20+50	100	C147
5322 122 34041	10N	+20+50	100	C150
4822 122 31081	100P			C151
4822 124 20534	680M	+10+50	40	C152
4822 121 40104	150N	10	250	C153
4822 124 20586	150M	+10+50	16	C154
4822 124 20589	220M	+10+50	10	C155
4822 124 20589	220M	+10+50	10	C156
4822 124 20589	220M	+10+50	10	C157
4822 124 20499	22M	+10+50	63	C160
4822 124 20534	680M	+10+50	40	C161
5322 122 34041	10N	+20+50	100	C162
5322 124 24116	1M			C163
4822 122 31165	330P	10	100	C164
5322 124 14075	1M	+10+50	25	C165
5322 122 34041	10N	+20+50	100	C166
4822 121 40232	220N	10	100	C167
5322 124 14066	10M	+10+50	6.3	C168
5322 122 34041	10N	+20+50	100	C169
4822 122 31081	100P	2	100	C170
5322 121 40323	100N	10	100	C172
5322 121 40323	100N	10	100	C176
4822 122 30114	2.2N	10	100	C178
5322 122 34041	10N	+20+50	100	C179
4822 121 41156	68N	10	250	C180
5322 121 44137	68N	10	250	C181
5322 121 44137	68N	10	250	C182
5322 121 44137	68N	10	250	C183
5322 121 44137	68N	10	250	C184
5322 121 44137	68N	10	250	C185
5322 121 44137	68N	10	250	C186
5322 121 44137	68N	10	250	C187
5322 121 44137	68N	10	250	C188
4822 121 40104	150N	10	250	C189

UNIT U1 ALL MODELS
VARIABLE CAPACITORS

Ordering number	Farad	Volts	Item
5322 125 54024	2-9P	300	C102
5322 125 54024	2-9P	300	C112

UNIT U1 ALL MODELS
INTEGRATED CIRCUITS

Ordering number	Type	Item
5322 209 85408	MC1651L	IC101
5322 209 84643	MC10102P	IC102
5322 209 85409	GXB10110	IC103
5322 209 84825	MC10216P	IC104
5322 209 84183	SN74S74N	IC125
5322 209 84183	SN74S74N	IC126
5322 209 84304	SN75107AN	IC127
5322 209 85406	N74LS54A	IC128
5322 209 84628	N7403A	IC129
5322 209 84528	SN7400N	IC130
5322 209 84722	GZF1201P MOS	IC131
5322 209 84722	GZF1201P MOS	IC132
5322 209 85001	SN74LS157N	IC133
5322 209 84996	SN74LS10N	IC134
5322 209 84183	SN74LS74N	IC135
5322 209 84724	SN74S64N	IC136
5322 209 85407	N74S02A	IC137
5322 209 84655	723PC	IC150
5322 209 85085	F34049PC SELECTED	IC151
5322 209 84983	SN74LS00N	IC152
5322 209 85412	CD4093BE MOS	IC153
5322 209 84983	SN74LS00N	IC154
5322 209 84993	SN74LS02N	IC155
5322 209 84993	SN74LS02N	IC156
5322 209 84976	F34001PC	IC157
5322 209 84983	SN74LS00N	IC158
5322 209 84984	SN74LS04N	IC159
5322 209 85411	82S90A	IC174
5322 209 80059	SN7475N	IC175
5322 209 84529	SN7403N	IC176
5322 209 84722	GZF1201P MOS	IC177
5322 209 84722	GZF1201P MOS	IC178
5322 209 80072	SN7490AN	IC179
5322 209 80142	SN7442AN	IC180
5322 209 84723	DM8884AN	IC181
5322 111 94015	6X1.0K	IC190
5322 111 94015	6X1.0K	IC191
5322 111 94031	6X47K	IC192
5322 111 94031	6X47K	IC193
5322 111 94012	6X6.8K	IC194
5322 111 94012	6X6.8K	IC195
5322 111 94031	6X47K	IC196
5322 111 94012	6X6.8K	IC197
5322 111 94026	6X470K	IC198

UNIT U1 ALL MODELS
TRANSISTORS

Ordering number	Type	Item
5322 130 44578	E411 SILICONIX	TS101
5322 130 44578	E411 SILICONIX	TS102
5322 130 44435	2N5770	TS103
5322 130 44435	2N5770	TS104
5322 130 44197	BC558B	TS105
5322 130 44197	BC558B	TS106
5322 130 40407	2N2369	TS142
4822 130 40855	BC337	TS146
5322 130 24035	BT100A-02	TS150
5322 130 40482	BRY39	TS151

4822 130 40855	BC337	TS152
5322 130 44417	BDX35	TS153
5322 130 40482	BRY39	TS154
5322 130 44418	BF256A	TS155
4822 130 40937	BC548B	TS156
5322 130 44256	BC557	TS177
5322 130 44247	BSS68	TS180
5322 130 44247	BSS68	TS181
5322 130 44247	BSS68	TS182
5322 130 44247	BSS68	TS183
5322 130 44247	BSS68	TS184
5322 130 44247	BSS68	TS185
5322 130 44247	BSS68	TS186
5322 130 44247	BSS68	TS187
5322 130 44247	BSS68	TS188

UNIT U1 ALL MODELS
DIODES

Ordering number	Type	Item
5322 130 30392	BZY88-C3V3	GR101
5322 130 30613	BAW62	GR102
5322 130 30613	BAW62	GR103
5322 130 30392	BZY88-C3V3	GR104
5322 130 34563	BZX79-C2V7	GR105
5322 130 30613	BAW62	GR106
5322 130 34563	BZX79-C2V7	GR107
5322 130 30613	BAW62	GR108
5322 130 30392	BZY88-C3V3	GR111
5322 130 30613	BAW62	GR112
5322 130 30613	BAW62	GR113
5322 130 30392	BZY-C3V3	GR114
5322 130 34563	BZX79-C2V7	GR115
5322 130 30613	BAW62	GR116
5322 130 34563	BZX79-C2V7	GR117
5322 130 30613	BAW62	GR118
5322 130 30613	BAW62	GR121
5322 130 34047	BZX75-C1V4	GR122
5322 130 30613	BAW62	GR125
5322 130 30613	BAW62	GR138
5322 130 30613	BAW62	GR139
5322 130 30613	BAW62	GR140
5322 130 30613	BAW62	GR141
5322 130 30613	BAW62	GR142
5322 130 30613	BAW62	GR143
5322 130 30613	BAW62	GR144
5322 130 30613	BAW62	GR145
5322 130 30774	BZX79-C10	GR151
5322 130 30594	BAV10	GR152
5322 130 34401	BZX70-C56	GR153
5322 130 30392	BZY88-C3V3	GR154
4822 130 30868	BY210-600	GR155
4822 130 30868	BY210-400	GR156
4822 130 30868	BY210-400	GR157
4822 130 30868	BY210-400	GR158
4822 130 30868	BY210-400	GR159
5322 130 30759	BZX79-C5V6	GR160
4822 130 30868	BY210-400	GR161
5322 130 30192	BY126	GR163
5322 130 30414	BY164	GR167
5322 130 30613	BAW62	GR170
5322 130 34049	BZX75-C2V1	GR171
5322 130 30613	BAW62	GR172
5322 130 30613	BAW62	GR173
5322 130 30613	BAW62	GR175
5322 130 34189	BAW20	GR180
5322 130 34189	BAW20	GR181
5322 130 34189	BAW20	GR182
5322 130 34189	BAW20	GR183
5322 130 34189	BAW20	GR184
5322 130 34189	BAW20	GR185
5322 130 34189	BAW20	GR186
5322 130 34189	BAW20	GR187
5322 130 34189	BAW20	GR188
5322 130 34166	BZX79-C51	GR189

UNIT U1 ALL MODELS
INDUCTANCES

Ordering number	Description	Item	Qty.
5322 158 10289	INDUCTANCE 0,68MH	L101	1
5322 158 10289	INDUCTANCE 0,68MH	L102	1
5322 158 10243	INDUCTANCE 100MH	L103	1
5322 158 10284	INDUCTANCE 47MH	L104	1
5322 158 10284	INDUCTANCE 47MH	L105	1
5322 158 10052	CHOKE	L150	1
4822 526 10097	FXC BEAD	L151	1
5322 158 10052	CHOKE	L152	1

UNIT U1 ALL MODELS
MECHANICAL PARTS

Ordering number	Description	Item	Qty.
5322 256 34031	FUSEHOLDER	VL150	2
5322 255 44107	IC HOLDER 16 PINS	D.I.L	2
5322 255 44112	IC HOLDER 18 PINS	D.I.L	5
5322 255 40089	TRANSISTOR HOLDER	TO 18-3	11
5322 255 40089	TRANSISTOR HOLDER	TO 18-4	2
5322 265 54006	TRANSISTOR HOLDER	TS153	1
5322 265 54006	FEMALE CONNECTOR	BU 102	1
5322 265 54018	MALE CONNECTOR	BU 102	1
5322 265 44064	MALE CONNECTOR	BU103	1
5322 265 44064	MALE CONNECTOR	BU104	1
5322 265 44064	MALE CONNECTOR	BU105	1
5322 255 44107	FEMALE CONNECTOR	BU106	1
5322 265 54006	FEMALE CONNECTOR	BU107	1
5322 101 94007	COMBINED SWITCH	SK101	1
5322 101 94007	COMBINED SWITCH	SK102	1
5322 276 14117	PUSH BUTTON SWITCH	SK103	1
5322 276 14117	PUSH BUTTON SWITCH	SK104	1
5322 273 74008	ROTARY SWITCH	SK105	1
5322 276 14117	PUSH BUTTON SWITCH	SK106	1
5322 276 14117	PUSH BUTTON SWITCH	SK107	1
5322 276 14117	PUSH BUTTON SWITCH	SK108	1
5322 101 64017	COMBINED SWITCH	SK109	1
5322 276 14117	PUSH BUTTON SWITCH	SK110	1
5322 276 14117	PUSH BUTTON SWITCH	SK116	1
5322 276 14117	PUSH BUTTON SWITCH	SK117	1
5322 276 14117	PUSH BUTTON SWITCH	SK118	1
5322 101 64017	COMBINED SWITCH	SK119	1
5322 276 14117	PUSH BUTTON SWITCH	SK120	1
5322 277 24006	SLIDE SWITCH	SK121	1

UNIT U1 ALL MODELS
MISCELLANEOUS

Ordering number	Description	Item	Qty.
5322 146 14079	MAINS TRANSFORMER	T101	1
5322 142 64027	DC-DC TRANSFORMER	T102	1
4822 253 20022	FUSE 1,6A FAST	VL150	1
4822 252 20001	THERMAL FUSE	VL101	1
5322 131 94042	DISPLAY	B101	1
5322 462 34127	GUIDE RAIL	FOR U1	14

FRONT PANEL ALL MODELS

Ordering number	Description	Item	Qty.
5322 456 14054	TEXT PLATE	PM6622	1
5322 456 14055	TEXT PLATE	PM6624	1
5322 456 14056	TEXT PLATE	PM6625	1
5322 450 64059	WINDOW		1
5322 414 34076	FUNCTION KNOB	SK105	1
5322 414 74019	COVER FUNCTION KNOB	SK105	1
5322 414 34091	DISPLAY KNOB	SK101	1
5322 414 74015	COVER DISPLAY KNOB	SK101	1
5322 414 34091	HOLD OFF KNOB	SK403	1
5322 414 74015	COVER HOLD OFF KNOB	SK403	1
5322 414 34091	TRIGGER KNOBS		2
5322 414 74015	COVER TRIGGER KNOBS		2
5322 414 14011	PUSH BUTTON KNOBS		10
5322 267 10004	INPUT SOCKETS A B	BU1 BU2	2

REAR PANEL ALL MODELS

Ordering number	Description	Item
5322 267 34059	EXT BATTERY SOCKET	BU21
5322 267 34059	EXT BATTERY SOCKET	BU22
5322 265 30066	MAINS INPUT SOCKET	BU23
5322 267 10004	INPUT D=10MHZ OUT	BU24
5322 267 10004	EXT. RESET	BU25
5322 267 10004	GATE OPEN	BU27
5322 277 24017	INT EXT STD SWITCH	SK22
5322 121 44092	CAPACITOR 47NF 250V	C1

CABINET ALL MODELS

Ordering number	Description	Item
5322 498 54048	HANDLE ARM	2
5322 498 54054	HANDLE PROFILE	1
5322 520 34164	BEARING BUSH	2
5322 414 64053	CAP HANDLE ARM	2
5322 447 84467	TOP COVER	1
5322 447 84466	BOTTON COVER	1
5322 466 85335	FRONT ORNAMENT	1
5322 459 24054	REAR ORNAMENT	1
5322 462 44181	REAR FOOT	4
5322 462 44179	BOTTON FOOT	4
4822 462 70497	PLUG BOTTOM FOOT	4

UNIT U3 ALL MODELS

Ordering number	Description	Item
5322 321 24389	CABLE COMPLETE	U3 TO U1
5322 268 24073	TEST SOCKET	BU302
5322 268 24073	TEST SOCKET	BU303
5322 130 34562	LD35/II	GR301
5322 130 34562	LD35/II	GR302
5322 130 34562	LD35/II	GR303
5322 130 34562	LD35/II	GR304
5322 130 34562	LD35/II	GR305
5322 130 34562	LD35/II	GR306
5322 130 34562	LD35/II	GR307

UNIT U4 ALL MODELS

Ordering number	Description	Item
5322 321 24391	CABLE COMPLETE	U4 TO U1
5322 277 24006	SLIDE SWITCH	SK401
5322 277 24006	SLIDE SWITCH	SK402
5322 101 54008	COMBINED SK403-SK404	R401
5322 121 54118	CAPACITOR 150NF 63V	C401

UNIT U2 PM6624
FIXED RESISTORS

Ordering number	Ohm	Tol.(%)	Type	Item
4822 116 51142	150	5	PR37	R201
5322 116 54396	68	5	PR52	R202
5322 116 54396	68	5	PR52	R203
5322 116 50417	162	5	MR25	R204
4822 111 30328	330	5	CR16	R205
4822 110 63125	4.7K	5	CR25	R206
4822 110 63147	33K	5	CR25	R207
4822 110 63107	1K	5	CR25	R208
4822 110 63125	4.7K	5	CR25	R209
4822 110 63152	47K	5	CR25	R210
4822 110 63107	1K	5	CR25	R211
4822 110 63138	15K	5	CR25	R212
4822 111 30067	33	5	CR16	R213
4822 110 63134	10K	5	CR25	R214
4822 110 63141	18K	5	CR25	R215
4822 110 63101	560	5	CR25	R216
4822 111 30264	2.7K	5	CR16	R217
4822 111 30323	270	5	CR16	R218
4822 111 30272	680	5	CR16	R219
4822 111 30245	47	5	CR16	R220
4822 111 30347	10	5	CR16	R221
4822 110 63161	100K	5	CR25	R222
4822 110 63116	2.2K	5	CR25	R223
4822 110 63125	4.7K	5	CR25	R224
4822 110 63134	10K	5	CR25	R225
4822 110 63098	470	5	CR25	R226
4822 110 63116	2.2K	5	CR25	R227
4822 110 63054	10	5	CR25	R228
4822 111 30272	680	5	CR25	R229
4822 110 63098	470	5	CR25	R230
4822 110 63116	2.2K	5	CR25	R231
4822 110 63125	4.7K	5	CR25	R238

UNIT U2 PM6624
FIXED CAPACITORS

Ordering number	Farad	Tol.(%)	Volts	Item
4822 122 31177	470P	10	100	C201
4822 122 31177	470P	10	100	C202
4822 122 31177	470P	10	100	C203
4822 122 31177	470P	10	10	C204
4822 122 30043	10N	-20+80	63	C205
5322 122 34043	47P	2	50	C206
4822 122 31175	1N	10	100	C207
5322 124 14079	68M		6.3	C208
4822 122 31043	3.9P	2	63	C209
4822 122 31173	220P	10	100	C211
4822 122 30094	220P	10	100	C212
4822 122 31177	470P	10	100	C213
4822 122 30043	10N	-20+80	63	C214
5322 124 14036	15M		16	C215
4822 122 31175	1N	10	100	C216
5322 122 34043	47P	2	100	C217
4822 122 31072	47P	10	100	C218
4822 122 30043	10N	-20+80	63	C219
4822 122 31175	1N	10	100	C220
5322 122 34043	47P	2	50	C221
4822 122 31175	1N	10	100	C222
4822 122 31175	1N	10	100	C223
5322 124 14079	68M		6.3	C224
4822 122 30043	10N	-20+80	63	C225
4822 122 31072	47P	10	100	C226
4822 122 31173	220P	10	100	C227

UNIT U2 PM6624
INTEGRATED CIRCUITS

Ordering number	Type	Item
5322 209 85414	OM334	IC201
5322 209 85414	OM334	IC202
5322 209 84721	SP670B	IC203
5322 209 84163	SN72741P	IC204
5322 209 84163	SN72741P	IC205
5322 209 84165	SN7474N	IC206
5322 209 84165	SN7474N	IC207

UNIT U2 PM6624
TRANSISTORS

Ordering number	Type	Item
4822 130 40937	BC548B	TS201
5322 130 40348	BC178B	TS202
5322 130 44179	BFR90	TS203
4822 130 40937	BC548B	TS204
5322 130 40343	BC108B	TS205

UNIT U2 PM6224
DIODES

Ordering number	Type	Item
5322 130 34364	BA379	GR201
5322 130 34364	BA379	GR202
5322 130 34283	HP5082-2835	GR203
5322 130 34283	HP5082-2835	GR204
5322 130 34364	BA379	GR205
5322 130 34364	BA379	GR206
5322 130 34364	BA379	GR207
5322 130 30613	BAW62	GR208
5322 130 34283	HP5082-2835	GR209
5322 130 34283	HP5082-2835	GR210
5322 130 30666	BZX79-C7V5	GR211

UNIT U2 PM6624
INDUCTANCES

Ordering number	Description	Item
5322 158 14119	COIL	L201
5322 158 14119	COIL	L202
5322 158 10276	INDUCTANCE 4.7MH	L203
5322 158 14119	COIL	L204
4822 526 10025	FXC BEAD	L205
4822 526 10025	FXC BEAD	L207
4822 526 10025	FXC BEAD	L208
4822 526 10025	FXC BEAD	L209
4822 526 10025	FXC BEAD	L210
5322 526 14019	BEAD	L211

UNIT U2 PM6624
MECHANICAL PARTS

Ordering number	Description	Item	Qty
5322 265 54006	FEMALE CONNECTOR	BU201	1
5322 265 54018	MALE CONNECTOR	BU201	1
5322 535 94711	DISTANCE PIECE	FOR U2	2
5322 462 34054	GUIDE RAIL	FOR U2	2
5322 255 44122	IC HOLDER 14 PINS	DIL	1
5322 255 40089	TRANSISTOR HOLDER	TO18-3	2

UNIT U2 PM6625
FIXED RESISTORS

Ordering number	Ohm	Tol (%)	Type	Item
5322 116 54393	150	5	PR52	R201
5322 116 54396	68	5	PR52	R202
5322 116 54396	68	5	PR52	R203
5322 116 50417	162	5	MR25	R204
4822 111 30328	330	5	CR16	R205
4822 110 63125	4.7K	5	CR25	R206
4822 110 63147	33K	5	CR25	R207
4822 110 63107	1K	5	CR25	R208
4822 110 63125	4.7K	5	CR25	R209
4822 110 63152	47K	5	CR25	R210
4822 110 63107	1K	5	CR25	R211
4822 110 63138	15K	5	CR25	R212
4822 111 30348	27	5	CR16	R213
4822 110 63134	10K	5	CR25	R214
4822 110 63141	18K	5	CR25	R215
4822 110 63094	330	5	CR25	R216
4822 111 30265	2.2K	5	CR16	R217
4822 111 30331	470	5	CR16	R218
4822 111 30312	4.7K	5	CR16	R219
4822 111 30327	220	5	CR16	R220
4822 111 30347	10	5	CR16	R221
4822 110 63161	100K	5	CR25	R222
4822 110 63116	2.2K	5	CR25	R223
4822 110 63116	2.2K	5	CR25	R224
4822 110 63134	10K	5	CR25	R225
4822 110 63098	470	5	CR25	R226
4822 110 63116	2.2K	5	CR25	R227
4822 110 63054	10	5	CR25	R228
4822 111 30272	680	5	CR16	R229
4822 110 63098	470	5	CR25	R230
4822 110 63116	2.2K	5	CR25	R231
4822 111 30324	100	5	CR16	R233
4822 111 30328	330	5	CR16	R234
4822 111 30328	330	5	CR16	R235
4822 110 63098	470	5	CR16	R236
4822 110 63069	39	5	CR16	R237
4822 110 63125	4.7K	5	CR16	R238

UNIT U2 PM6625
FIXED CAPACITORS

Ordering number	Farad	Tol (%)	Volts	Item
5322 122 34071	470P	20	50	C201
5322 122 34071	470P	20	50	C202
5322 122 34071	470P	20	50	C203
5322 122 34071	470P	20	50	C204
4822 122 30043	10N	-20+80	63	C205
5322 122 34043	47P	10	50	C206
4822 122 31175	1N	10	100	C207
5322 124 14079	68M	-10+50	6.3	C208
5322 122 34043	47P	10	50	C209
4822 122 31173	220P	10	100	C210
4822 122 31173	220P	10	100	C211
4822 122 31173	220P	10	100	C212
5322 122 34071	470P	10	50	C213
4822 122 30043	10N	-20+80	63	C214
5322 124 14036	15M	-10+50	16	C215
4822 122 31175	1N	10	100	C216
5322 122 34071	470P	20	50	C217
5322 122 34042	12P	10	50	C218
4822 122 30043	10N	-20+80	63	C219
4822 122 31175	1N	10	100	C220
4822 122 30043	10N	-20+80	63	C221
5322 122 34043	47P	10	50	C222
5322 122 34071	470P	20	50	C223
5322 124 14079	68M	-10+50	6.3	C224
5322 122 34071	470P	10	50	C225
4822 122 31072	47P	2	100	C226
5322 122 34071	470P	20	50	C227
4822 122 31072	47P	2	100	C228
4822 122 30043	10N	-20+80	63	C229
5322 122 34043	47P	10	50	C230
4822 122 31054	10P	2	100	C231

UNIT U2 PM6625
INTERGRATED CIRCUITS

Ordering number	Type	Item
5322 209 85414	OM334	1C201
5322 209 85414	OM334	1C202
5322 209 84725	SP8616B	1C203
5322 209 84165	SN72741P	1C204
5322 209 84165	SN72741P	1C205
5322 209 84165	SN7474N	1C206
5322 209 84165	SN7474N	1C207
5322 209 84729	SP8600B	1C208

UNIT U2 PM6625
TRANSISTORS

Ordering number	Type	Item
4822 130 40937	BC548B	TS201
5322 130 40348	BC178B	TS202
5322 130 44179	BFR90	TS203
4822 130 40937	BC548B	TS204
5322 130 40343	BC108B	TS205
5322 130 44435	2N5770	TS206

UNIT U2 PM6625
DIODES

Ordering number	Type	Item
5322 130 34364	BA379	GR201
5322 130 34364	BA379	GR202
5322 130 34283	HP5082-2835	GR203
5322 130 34283	HP5082-2835	GR204
5322 130 34364	BA379	GR205
5322 130 34364	BA379	GR206
5322 130 34364	BA379	GR207
5322 130 30613	BAW62	GR208
5322 130 34283	HP5082-2835	GR209
5322 130 34283	HP5082-2835	GR210
5322 130 30666	BZX79-C7V5	GR211
5322 130 34364	BA379	GR212
5322 130 30666	BZX79-C7V5	GR213
5322 130 30411	BZX79-C3V9	GR214
5322 130 30411	BZX79-C3V9	GR215

UNIT U2 PM6625
INDUCTANSES

Ordering number	Description	Item
5322 158 14119	COIL	L201
5322 158 14119	COIL	L202
5322 158 10276	INDUCTANCE 4,7MH	L203
5322 158 14119	COIL	L204
5322 158 14119	COIL	L205
5322 158 14119	COIL	L206
5322 158 14119	COIL	L207
5322 158 14119	COIL	L208
5322 157 44024	COIL	L209
4822 526 10025	FXC BEAD	L210
4822 526 10025	FXC BEAD	L211
4822 526 10025	FXC BEAD	L212
4822 526 10025	FXC BEAD	L214

UNIT U2 PM6625
MECHANICAL PARTS

Ordering number	Description	Item	Qty.
5322 265 54006	FEMALE CONNECTOR	BU201	1
5322 265 54018	MALE CONNECTOR	BU201	1
5322 535 94711	DISTANCE PIECE	FOR U2	2
5322 255 44122	IC HOLDER 14 PINS	DIL	1
5322 255 40089	TRANSISTOR HOLDER	TO18-3	2
5322 462 34054	GUIDE RAIL		2

5. Circuit description prescaler units and power supply

5.1. Prescaler PM 6624

Unit U2 contains the 520 MHz amplifier and prescaler circuits, and also two D flip-flops IC 206 and IC 207 dividing the time base signal generated on unit U1.
The signal to be measured enters the input amplifier at socket BU 2. After AC coupling capacitor C 201, a resistive atteuator network R 201 . . . R 204 is incorporated which maintains he VSWR of the input and also serves as a series impedance for the PIN diode attentuator GR 201 and GR 202. Schottky diodes GR 203 and GR 204 are clipping the signal but generate also current to the PIN diodes which provide automatically the proper attenuation of high-amplitude signals.
At low amplitude the signal passes this first PIN diode attenuator unchanged to the next PIN diode attenuator GR 205 . . . GR 207. Here the amplitude is reduced further before the signal is entering the input amplifier.
After input conditioning, the measuring signal is applied to two cascade wide-band amplifiers IC 201 and IC 202. The signal level at IC 202 is detected by GR 209, GR 210 controlling the AGC amplifier IC 204 and Schmitt trigger IC 205.
When the detected level is sufficient, IC 204 starts controlling the PIN diode attenuator GR 205 . . . GR 207. Transistor TS 201 ensures a linear attenuator response within the input signal range.
Via R 213, C 213 and amplifier TS 203 the signal is fed to input 10 of divide-by-eight circuit IC 203. Output 1 provides the divided signal to the 80 MHz input omplifier, BU 201 The detected signal from GR 209, 210 is also fed to operationel amplifier IC 205 performing a Schmitt trigger function. When no measuring signal is present or at a low detected level, output IC 205:6 is positive. TS 204 is then turned on, shorts the output line to earth.
When the detected signal from GR 209, 210 has reached a sufficient level, IC 205:6 goes LOW and TS 204 is turned off.
TS 202 is controlled by switch SK 401. When the switch is set to position INPUT A the level at BU 201:5 PRESCALER, goes HIGH which turns TS 202 off. Via R 230 and GR 211, also TS 205 is switched off. No supply voltage for the amplifier is present until switch SK 401 is set to position INPUT C and BU 201:5 goes LOW.
The two D flip-flops of IC 206 and one D flip-flop of IC 207 provide the division by 8 of the time base frequency TB 1.

5.2. Prescaler PM 6625

The input conditioning section of the 1 GHz amplifier up to IC 201 and the AGC and Schmitt trigger circuits are principally the same as in the 520 MHz amplifier of PM 6624. Refer to that description.
After input conditioning, the measuring signal is applied to two cascade wide-band amplifiers IC 201 and IC 202. The signal level at IC 202:7 is detected by GR 209, GR 210 controlling the AGC amplifier IC 204 and Schmitt trigger IC 205.
Via R 213, C 213 and amplifier TS 203, the signal is fed to input 4 of divide-by-four circuit IC 203. The complementary outputs 10 and 11 of this circuit provide the signal to the next 4-divider IC 208 via zeners GR 214, GR 215. These diodes are interfacing the +1 V output of IC 203 with the —3 V input requirement of IC 208. The measuring signal frequency now divided by 16, is fed via TS 206 to the output line BU 201:1 which is connected with BU 102:1 to the 80 MHz input amplifier.
TS 202 is controlled by switch SK 401. When the switch is set to position INPUT A the level at BU 201:5, PRESCALER, goes HIGH which turns TS 202 off. Via R 230 and GR 211 also TS 205 is switched off. No supply voltage for the amplifier is present until SK 401 is set to position INPUT C and BU 201:5 goes LOW.
The four D flip-flops of IC 206 and IC 207 provide the division by 16 of the time base frequency TB 1.

5.3. Power supply

The power supply operates from 115 V AC or 230 V AC 50 to 400 Hz *or* from the internal battery PM 9673 *or* from an external battery with an output voltage of 12 to 28 V. It provides five stabilised and overload-protected voltages of +120 V, +12 V, +5 V, —5 V and —50 V.
The power supply may be divided into the *power input circuit* mainly consisting of the mains transformer T 101 and rectifier GR 167, the *over-voltage protection circuit* mainly consisting of thyristors TS 150, TS 151 and zener diode GR 160, the *voltage regulation circuit* mainly consisting of voltage regulator IC 150, thyristor TS 154, the *DC-to-DC converter* mainly consisting of primary side of transformer T 102, driver TS 152 and switch TS 153.

Power input circuit

When the power supply operates from the *mains*, the 115 V AC or 230 V AC is transformed to 20 V AC by transformer T 101, rectified in the diode-bridge GR 167, filtered by C 152 and C 161 and fed to the power supply circuits via switch SK 121 and SK 102.
When the power supply operates from an *external battery* the current to the power supply circuits is fed from BU 21 at the rear panel via protecting diode GR 164 and switches SK 121 and SK 102.
When the internal battery is used the current is fed from pin 8 of BU 105 via SK 121 and SK 102 to the power supply circuits.

Over-voltage protection

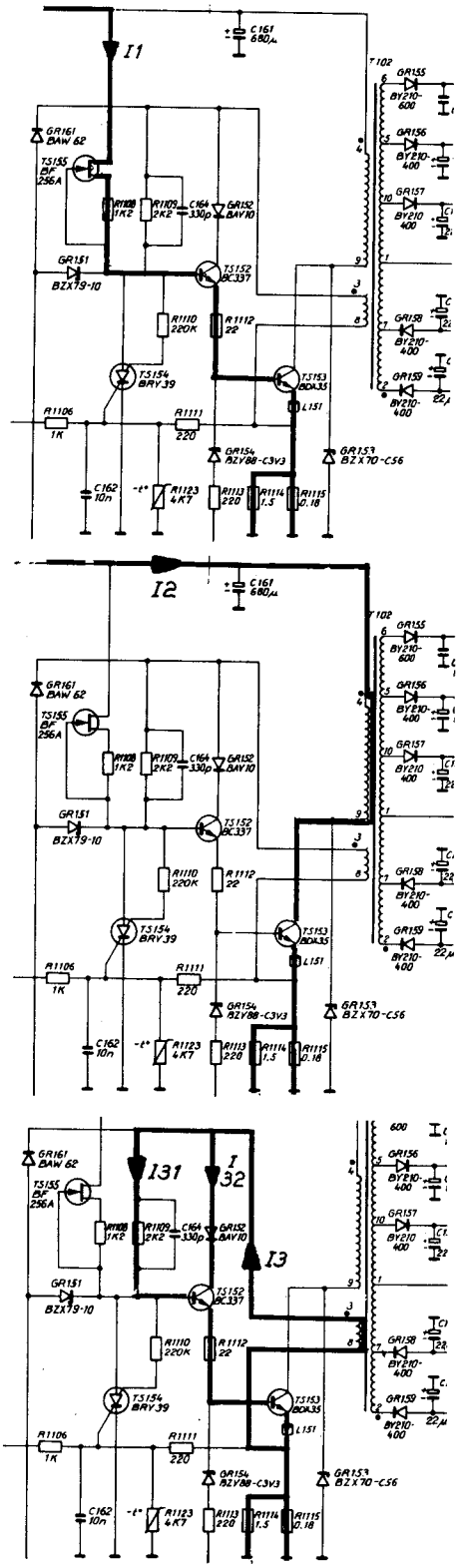
The over-voltage protection circuit consists mainly of thyristors TS 150, TS 151 and zener diode GR 160.
The anode of GR 160 is connected to the +5 V output from the power supply. If this voltage increases to 5.6 V ... 5.8 V, the zener diode GR 160 will start to conduct and a current will flow through resistor R 1121. The voltage drop across R 1121 is fed to the gate of thyristor TS 151 via resistor R 1120. The anode is connected to the +5 V output voltage via resistor R 1118.
The thyristor will switch on and a voltage drop arises across resistor R 1122. This voltage is fed to the gate of thyristor TS 150, whose anode is connected to the d.c. input voltage. The thyristor will switch on and blow fuse VL 150, or, if the counter is operating in the internal battery mode, fuse VL 1 in the battery unit PM 9673. The capacitor across the gate and cathode of thyristor TS 151 prevents transients from the mains to blow fuse VL 150 accidentally.

DC to DC converter

The DC to DC converter is basically a blocking oscillator consisting mainly of switch transistor TS 153 and terminals 4—9 of the transformer T 102. When switch SK 102 is set to position ON, the DC voltage from the *power input circuit* is fed to the transistor TS 155 which works as a constant current source of approximately 1 mA (I_1).
The current I_1 will cause switch transistor TS 153 to start conducting and the linearly increasing current I_2 to flow.
This current I_2 will cause a voltage across terminals 3—8 of the transformer and the current I_3 will start to flow.
This will cause drive transistor TS 152 to saturate switch transistor TS 153. When the transistor no longer can saturate, current I_3 will stop to increase and the induced voltage at terminal 3 of transformer T 102 will disappear.
This will cause TS 153 to switch off and the collector voltage to rise to the same level as the supply voltage. At this moment the magnetic flux will discharge through the secondary windings of T 102 and diodes GR 155—159.

Output voltage regulation circuit

The output voltage regulation circuit consists mainly of voltage regulator IC 150 and thyristor TS 154.
The purpose of the thyristor TS 154 is to switch off the drive transistor TS 152 in order to regulate the output voltage. The switching moment of thyristor TS 154 is determined by a voltage at the gate of the thyristor which is the sum of a DC regulation voltage from terminal 10 of IC 150 and a sawtooth voltage caused by the emitter current of TS 153 through resistor R 1114//R 1115.
The voltage regulator IC 150 is fed at terminal 12 with the supply voltage and at terminal 7 with a negative voltage, via GR 161, from winding 3—8 of transformer T 102.
IC 150 contains a differential amplifier with inputs at terminals 4 and 5.
The input at terminal 5 is grounded via R 1104 and the input at terminal 4 is connected to a voltage divider that consists of the reference output at terminal 6 and the negative voltage from winding 3—8 of transformer T 102 at terminal 7.
The differential amplifier is in balance when the voltage at terminal 7 is —5 V. When the supply voltage across windings 4—9 of transformer T 102 increases, the voltage at the differential amplifier at terminal 7 of IC 150 will go more negative, the DC regulation voltage at terminal 10 of IC 150 will go positive and turn on thyristor TS 154. This will connect the base of driver transistor to the ground and cause switch transistor TS 153 to switch off. The stored magnetic flux will then discharge in the secondary windings of T 102 and diodes GR 155—GR 159.



6. Test conditons

6.1. DC voltages.

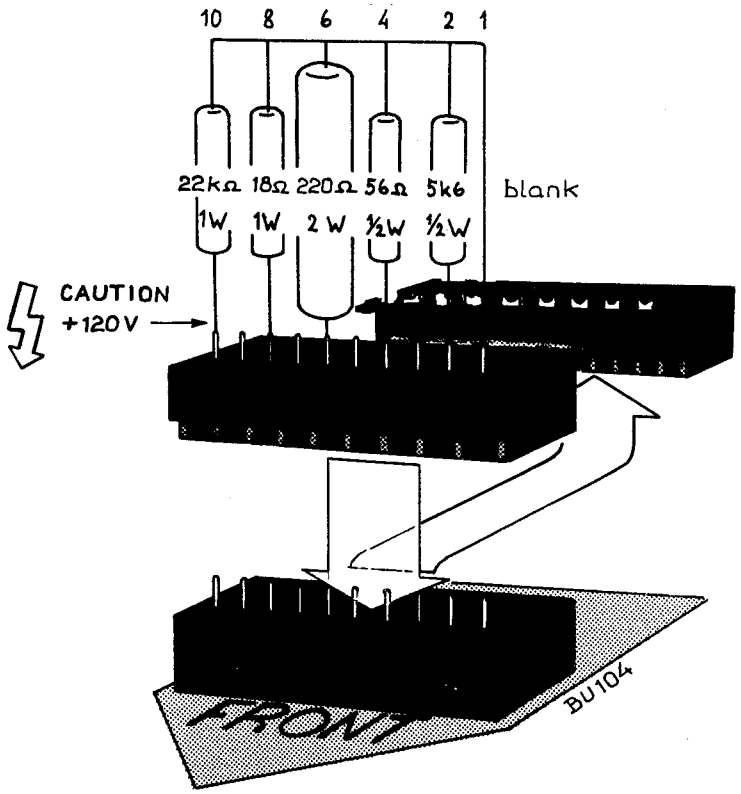
The d.c. voltages in the circuit diagrams are typical and may vary slightly between instruments.
Unless otherwise stated the voltages are positive related to earth and measured without input signal. The test instrument can be analogue or digital with an input impedance of at least 40 kΩ/V.

NOTE. When measuring d.c. voltages in the input amplifier of the prescaler use sampling oscilloscope PM 3400 and FET probe PM 9353.

6.2. Troubleshooting the power supply section
A fault in the power supply can be isolated easier if the counter circuits are disconnected by removing 10-pins connector BU 107. However, to simulate the load, a dummy load has to be fitted as shown in the figure. The dummy load can be assembled of the following components:

1 female connector 10 pins	5322 267 54102
1 carbon resistor 22Ω, 1 W	4822 110 23143
1 carbon resistor 220Ω, 1 W	4822 110 23089
1 carbon resistor, 18Ω, 2 W	4822 110 10061
1 carbon resistor, 56Ω, 0.5 W	4822 110 53074
1 carbon resistor, 5.6 kΩ, 0.5 W	4822 110 53127

CAUTION: + 120 V at pin 10 of the connector!



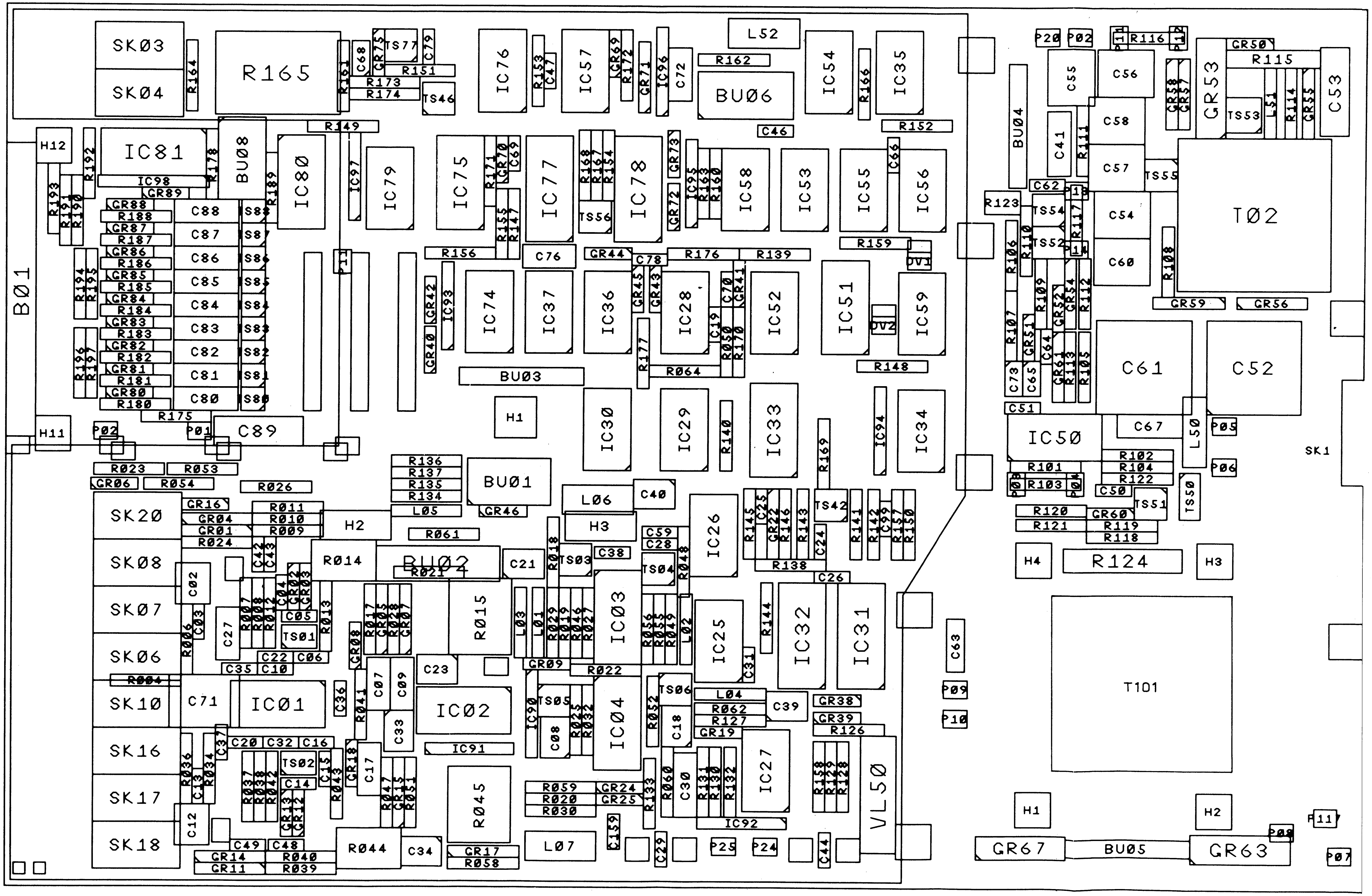
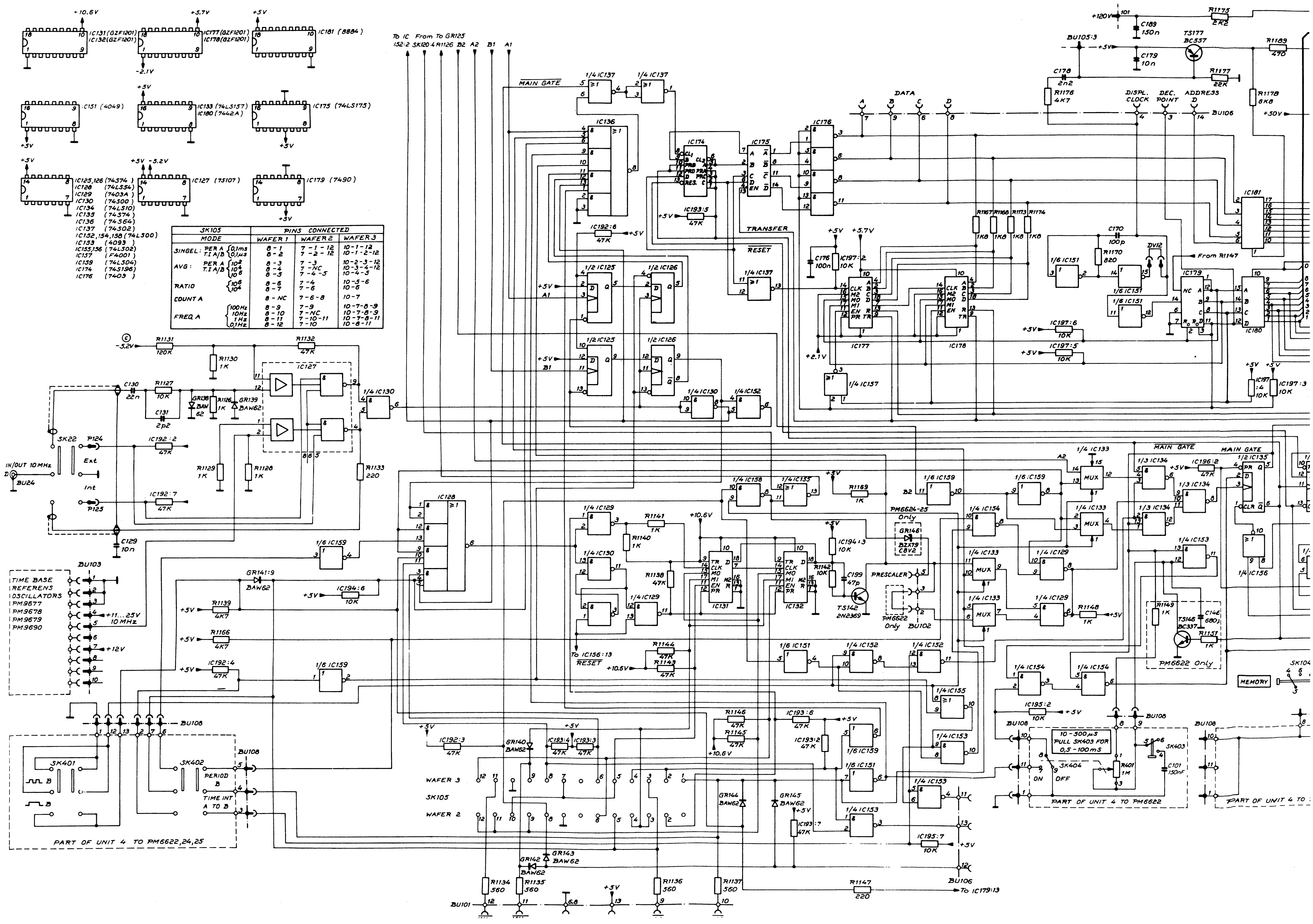


Figure X-2. Component layout U1



SK105		PINS CONNECTED		
MODE		WAFER 1	WAFER 2	WAFER 3
SINGEL: PER A	0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
SINGEL: T.I A/B	0,1μs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG: PER A / T.I A/B	10^2	8 - 3	7 - 3	10 - 2 - 3 - 12
	10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^6	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1 Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1Hz	8 - 12	7 - 10	10 - 8 - 11

Figure X-3. Circuit diagram Input/Output amplifier D, Oscillator, decimal counting unit, display and time base divider

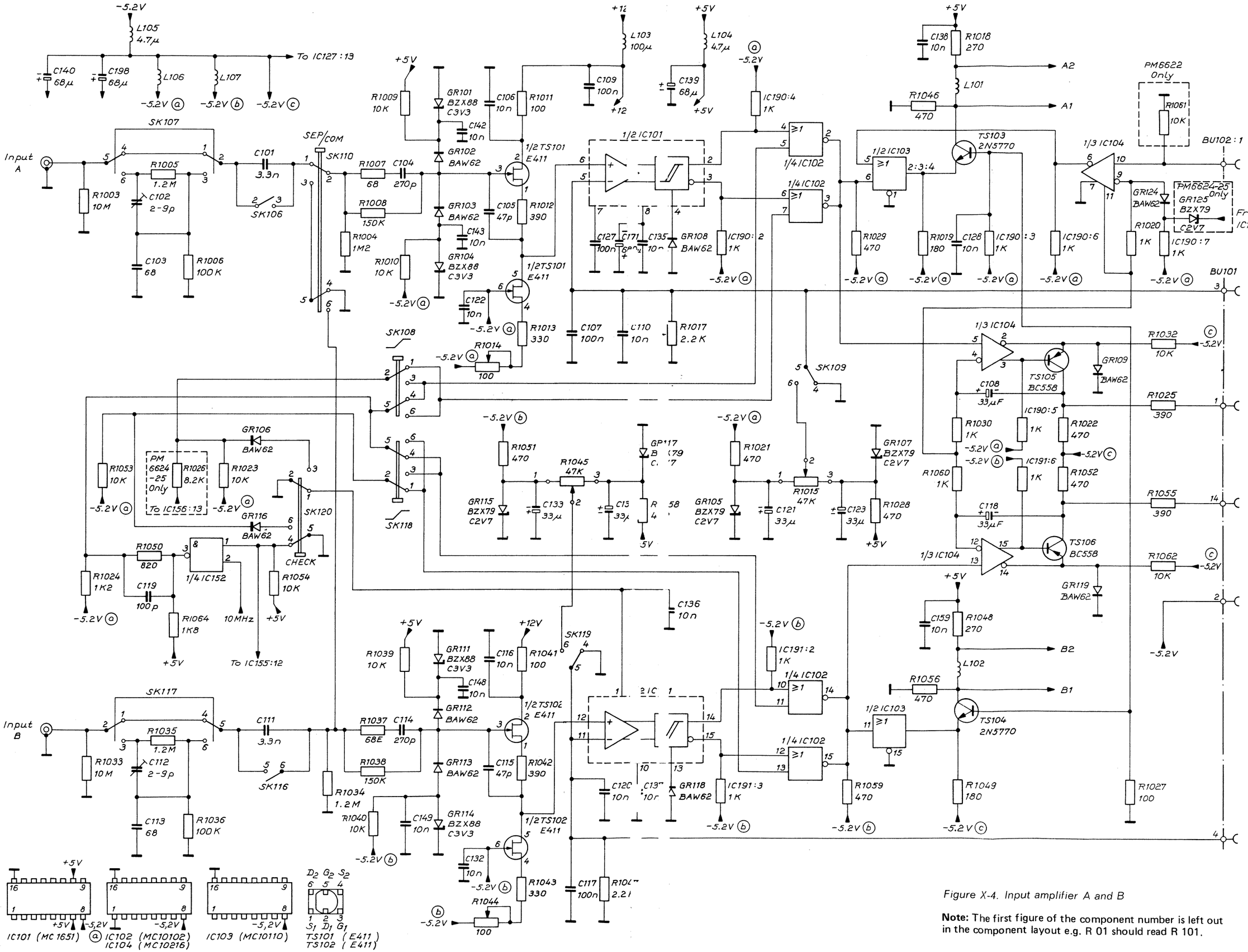


Figure X-4. Input amplifier A and B

Note: The first figure of the component number is left out in the component layout e.g. R 01 should read R 101.

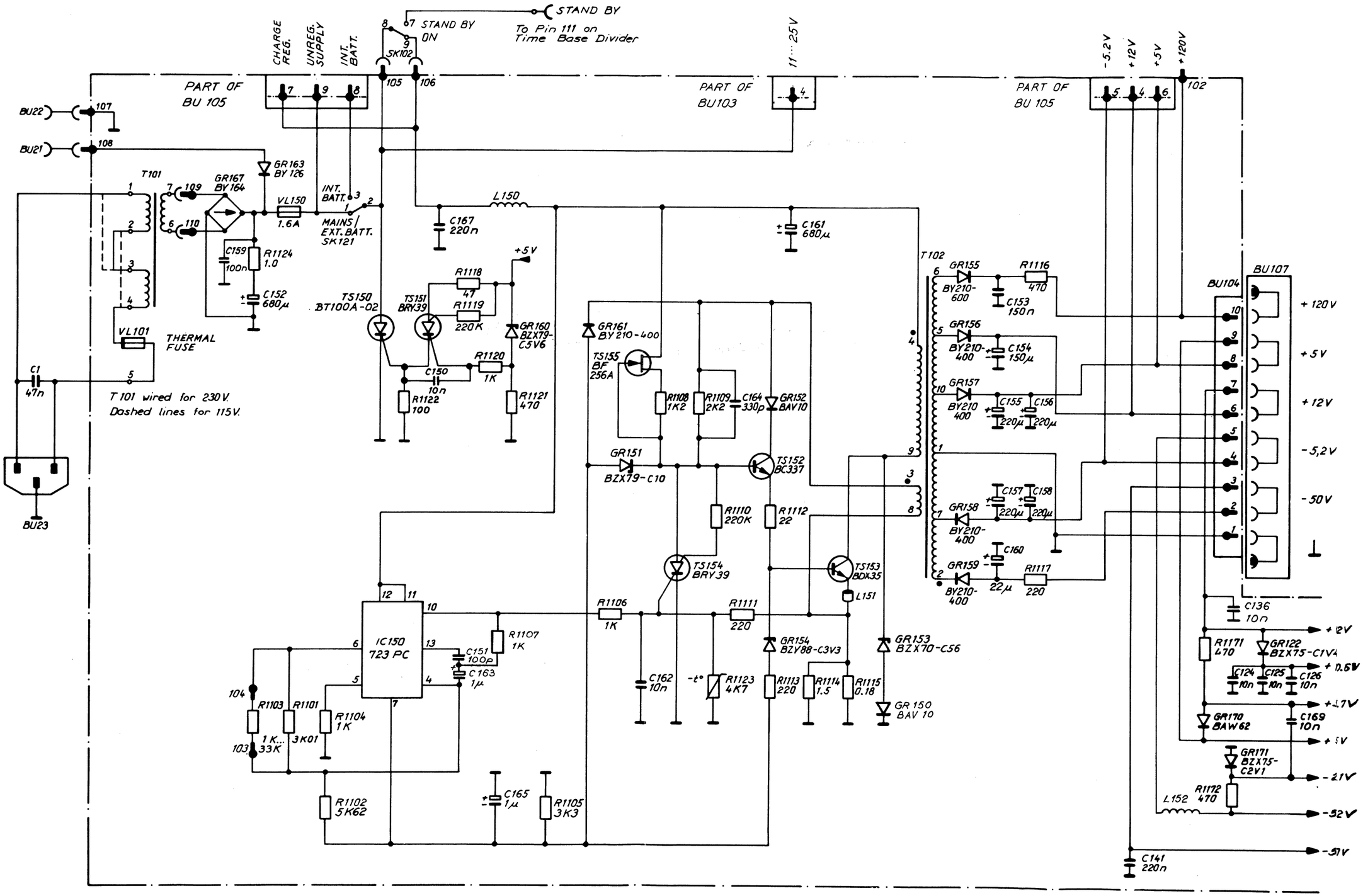


Figure X-5. Power supply

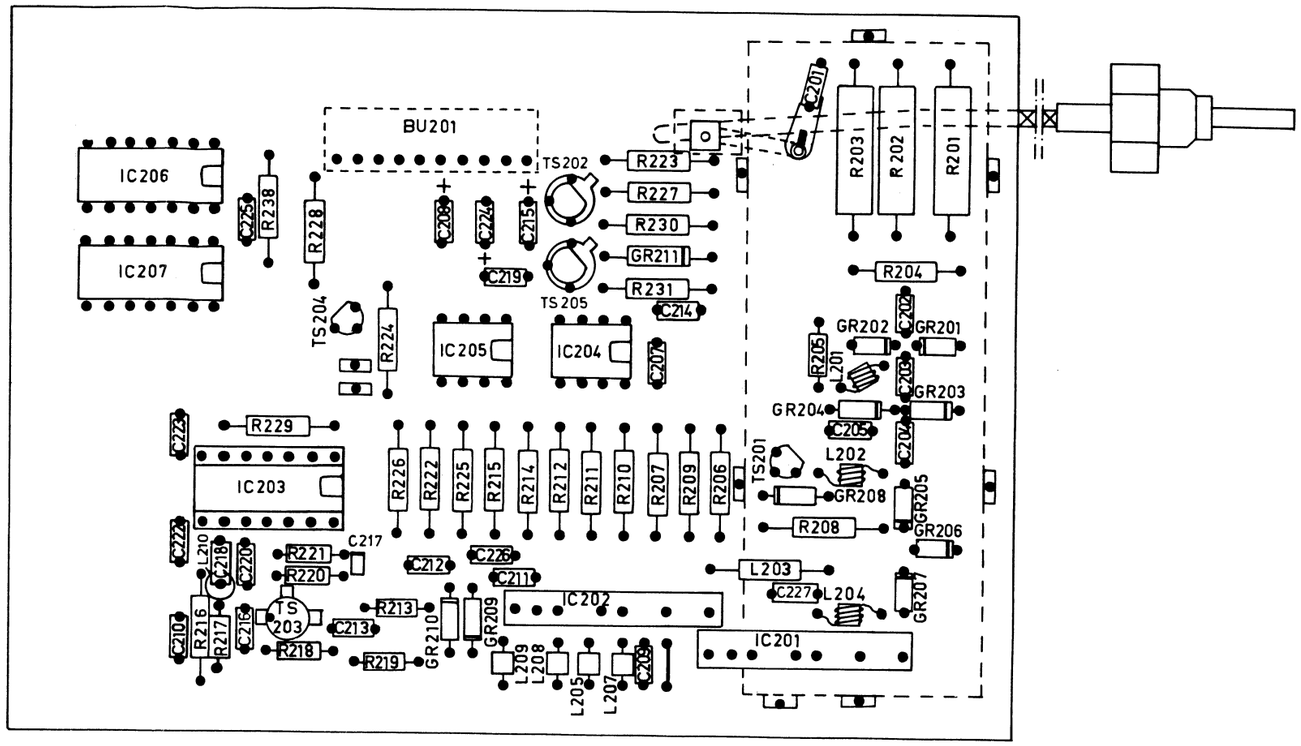


Figure X-6. Component layout prescaler PM 6624, Component side

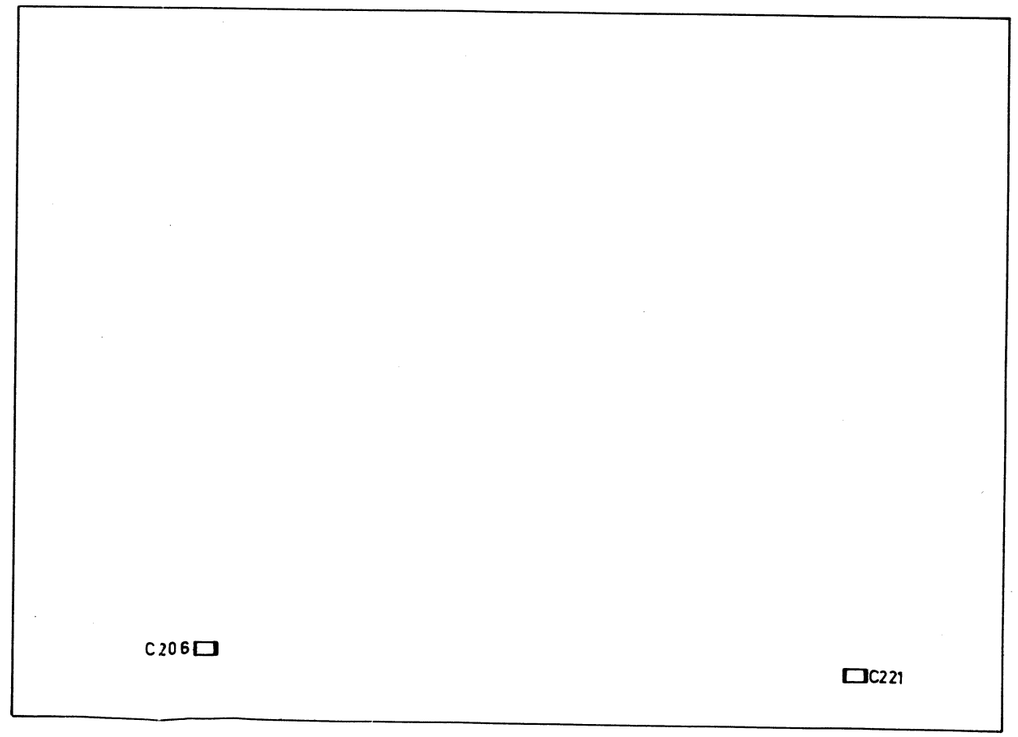


Figure X-7. Component layout prescaler PM 6624, Soldering

Input Voltage at BU2	Input Freq at BU2	Measured Voltage
-40 dBm	200 MHz	- 3 V
-20 dBm	200 MHz	+0.5 V
-10 dBm	200 MHz	+2 V

* measurable input signal at BU2

Figure X-8. Circuit diagram prescaler PM 6624

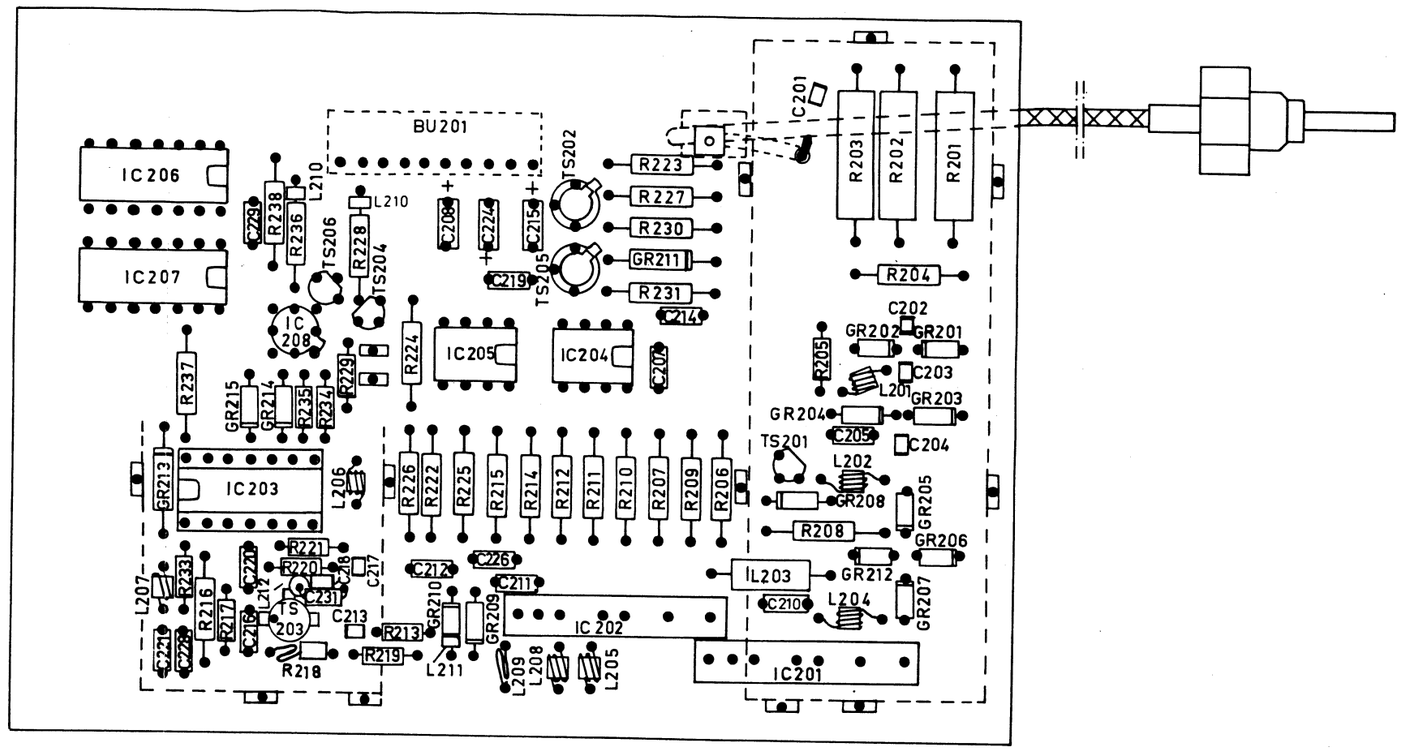


Figure X-9. Component layout prescaler PM 6625, Component side

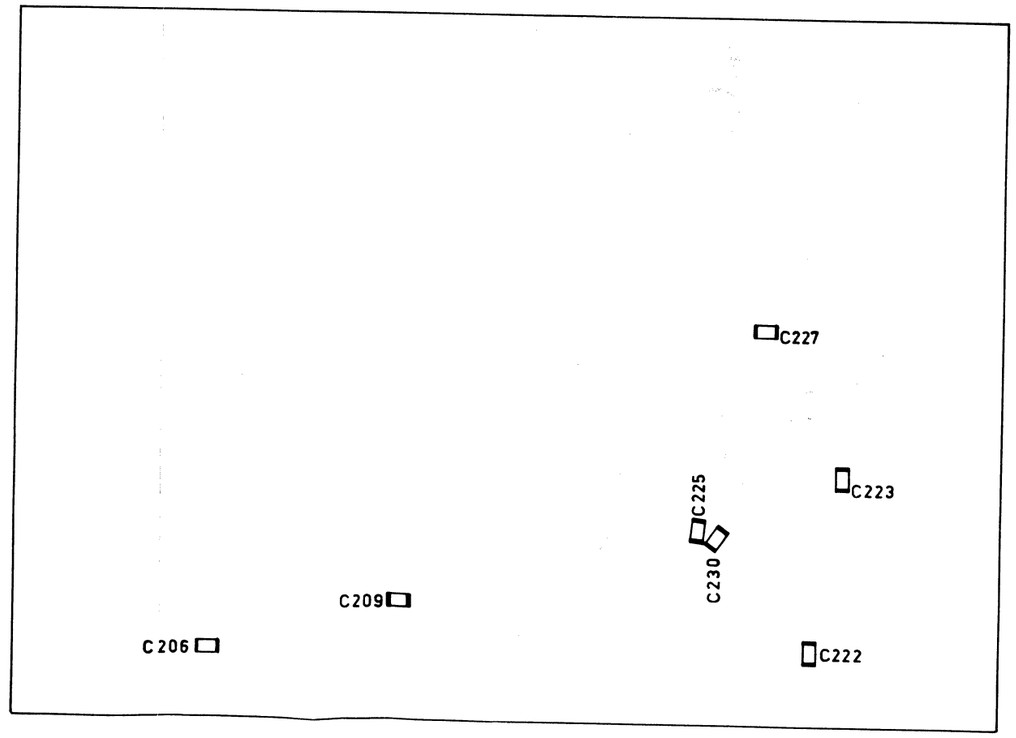


Figure X-10. Component layout prescaler PM 6625, Soldering side

QUALITY REPORTING

CODING SYSTEM FOR FAILURE DESCRIPTION

The following information is meant for Philips service workshops only and serves as a guide for exact reporting of service repairs and maintenance routines on the workshop charts.
For full details reference is made to Information G1 (Introduction) and Information Cd 689 (Specific information for Test and Measuring Instruments).

LOCATION

□□□

Unit number
e.g. 000A or 0001 (for unit A or 1; **not 00UA or 00U1)**

or: Type number of an accessory (only if delivered with the equipment)
e.g. 9051 or 9532 (for PM 9051 or PM 9532)

or: Unknown/Not applicable
0000

CATEGORY

□

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

COMPONENT/SEQUENCE NUMBER

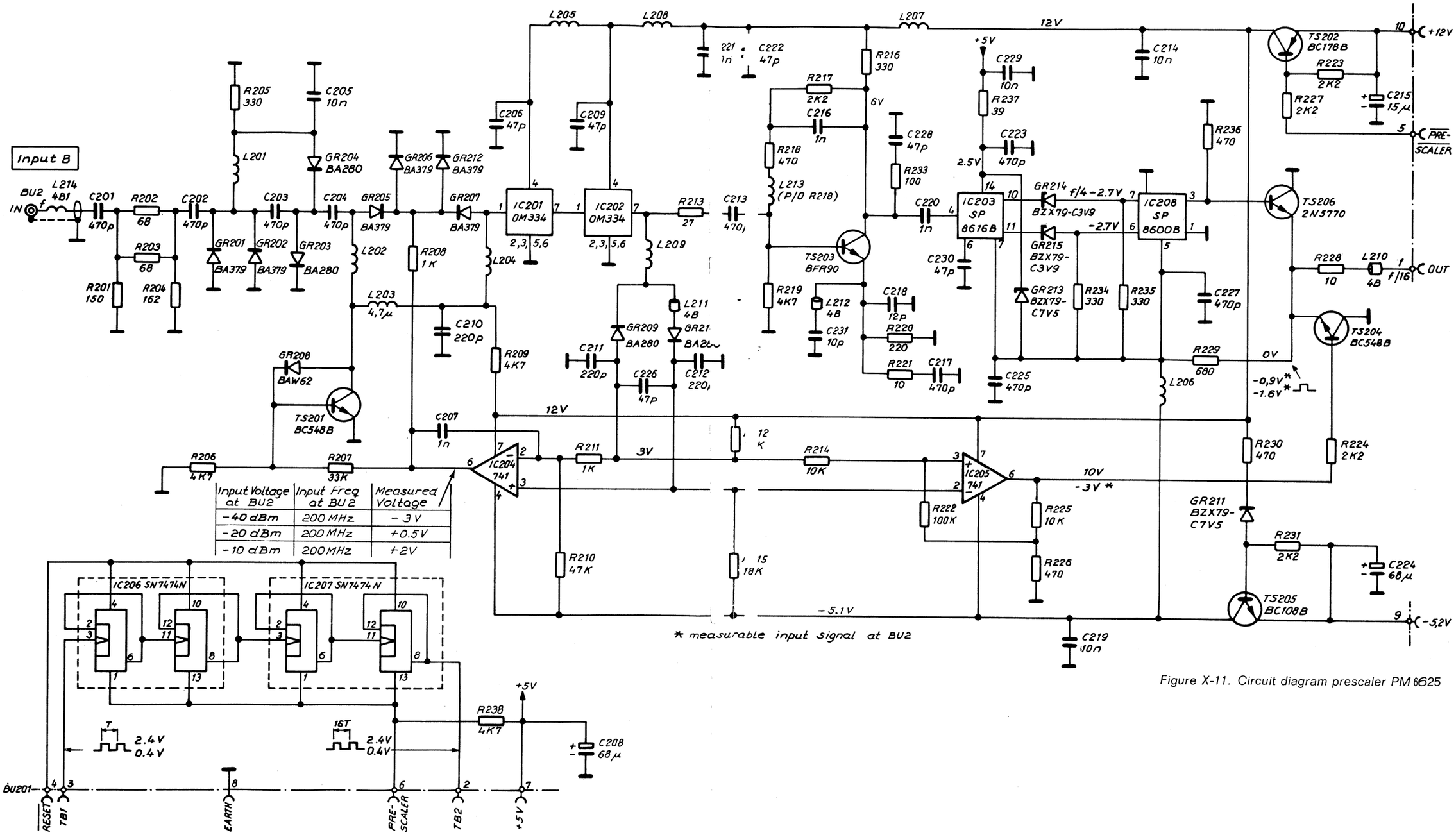
□□□□□

Enter the identification **as used in the circuit diagram**, e.g.:

GR1003	Diode GR1003
TS0023	Transistor TS23
IC0101	Integrated circuit IC101
R0....	Resistor, potentiometer
C0....	Capacitor, variable capacitor
B0....	Tube, valve
LA....	Lamp
VL....	Fuse
SK....	Switch
BU....	Connector, socket, terminal
T0....	Transformer
L0....	Coil
X0....	Crystal
CB....	Circuit block
RE....	Relay
BA....	Battery
TR....	Chopper

Parts not identified in the circuit diagram:

990000	Unknown/Not applicable
990001	Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002	Knob (incl. dial knob, cap, etc.)
990003	Probe (only if attached to instrument)
990004	Leads and associated plugs
990005	Holder (valve, transistor, fuse, board, etc.)
990006	Complete unit (p.w. board, h.t. unit, etc.)
990007	Accessory (only those without type number)
990008	Documentation (manual, supplement, etc.)
990009	Foreign object
990099	Miscellaneous



Input Voltage at BU2	Input Freq at BU2	Measured Voltage
-40 dBm	200 MHz	- 3 V
-20 dBm	200 MHz	+0.5 V
-10 dBm	200 MHz	+2V

Figure X-11. Circuit diagram prescaler PM 6625

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PHILIPS

PM 6622
9446 066 220.1

Instruction manual

Anleitung

Notice d'emploi et d'entretien

PM 6624
9446 066 240.1

PM 6625
9446 066 250.1

Ordering number of this manual 9499 460 09302

IMPORTANT

In correspondence concerning this instrument, please quote the type number and the serial number as given on the type plate on the rear of the instrument.

WICHTIG

Bei Schriftwechsel dieses Gerät betreffend, bitte die auf dem Typenschild an der Geräterückseite angegebene Typ- und Seriennummer zu vermelden.

IMPORTANT

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez toujours indiquer le numéro de type et le numéro de série qui sont marqués sur la plaquette signalétique.

CONTENTS

INHALT

TABLE DES MATIÈRES

N.V. PHILIPS' GLOEILAMPENFABRIKEN — EINDHOVEN — THE NETHERLANDS — 1978

Printed in Sweden/AB Duvbo tryckeri

Safety regulations

Upon delivery, the instrument complies with the required safety regulations. To maintain this condition and to ensure safe operation, it is recommended to follow the instructions below.

1. Before switching on

Protection The instrument is protected according to class 1 (protective earth) of the IEC 348 or VDE 0411. The mains cable provides earth connection. Outside specially protected rooms, the mains plug must be connected only to sockets with earthed contact. It is not allowed to interrupt the earth connection inside or outside the instrument.

Mounting The instrument may be used in any desired position. Do not place the instrument on any surface which produces or radiates heat, or in direct sunlight.

Earthing The instrument must be earthed in conformity with the local safety regulations. The mains cable delivered with the instrument includes a protective conductor, which is connected to the earth contacts of the plug. Thus, when connected to an earthed mains socket, the cabinet of the instrument is consequently connected to the protective earth. The circuit earth is connected internally to the external BNC socket and the cabinet. The BNC socket must not be used to connect a protective conductor. **Warning** Connect the mains cable plug only to a socket with protective earth contacts. This protection must not be ineffective e.g. by using an extension cable without earth protection.

Mains connection The instrument must be connected only to an AC supply. On delivery the instrument is set to 230 V or 115 V indicated on the plate at the rear of the instrument. Ensure that the instrument is set to the local mains voltage before switching on.
Mains connection must be made in accordance with the local safety regulations. This implies that the instrument is connected to the mains socket with a protective earth contact as described in section Earthing.

Mains Adjustment and Fuses The instrument can be set to 115 V or 230 V. In both cases the fuse should be 1.6 A fast action, in addition to this the primary side of the mains transformer is protected by a replacable thermal fuse. To convert the instrument proceed as follows:

- Unplug the mains cable
- Dismantle the instrument as described in section dismantling
- Resolder the wires of the mains transformer as shown on page 10.

2. Maintenance and Repair

Failure and Extensive Stress If the instrument is suspected of being unsafe take it out of operation. This is the case when the instrument shows physical damage or does not function anymore or is stressed beyond the tolerable limits e.g. during storage or transportation.

Dismantling the instrument When removing covers or other parts by means of tools, live parts or terminals could be exposed. Before opening the instrument, disconnect it from all power sources. If the open live instrument needs calibration, maintenance or a repair, it must be performed only by trained personnel being aware of the risks. After disconnection from all power sources, the capacitors in the instrument may remain charged for some seconds, observe the circuit diagrams. To dismantle the instrument proceed as follows:

- Unplug the mains cable
- Loosen the four rear screws
- Remove top and bottom covers

Repair and replacing parts Repairs must be made by trained personnel. Ensure that the construction of the instrument is not altered to the detriment of safety. Above all, leakage paths, air gaps and insulation layers must not be reduced. When replacing, use only original parts. Other spare parts are only acceptable when the safety precautions for the instrument are not impaired.

Schutzmassnahmen

Dieses Gerät entspricht bei der Werksauslieferung den geltenden Schutzvorschriften. Zur Erhaltung dieses Zustands und zur Gewährleistung der Betriebssicherheit wird die genaue Einhaltung nachstehender Hinweise empfohlen.

1. Vor der Inbetriebnahme

Schutzart Das Gerät entspricht der Schutzklasse I (Schutzleiteranschluss) gemäss IEC 348 bzw. VDE 0411. Die Geräteanschlussleitung enthält einen Schutzleiter. Ausser in Räumen mit besonderen Schutzmassnahmen darf das Gerät nur an Steckdosen mit Schutzkontakten (Schuko–Steckdosen) angeschlossen werden. Jede Unterbrechung des Schutzleiters innerhalb oder ausserhalb des Geräts ist unzulässig.

Aufstellung Das Gerät ist für jede Betriebslage vorgesehen. Wärmeeinwirkung und direkte Sonneneinstrahlung sind zu vermeiden.

Erdung Das Gerät ist nach Massgabe der örtlichen Vorschriften zu erden. Der Schutzleiter der Geräteanschlussleitung ist an die Schutzkontakte des Steckers angeschlossen. Auf diese Weise ist das Gehäuse des Geräts zwangsläufig mit Erde verbunden. Das Masse-Potential steht mit der äusseren BNC–Buchse und dem Gehäuse in Verbindung. Der Anschluss des Schutzleiters an die BNC–Buchse ist nicht zulässig. **Zu beachten!** Netzstecker nur an Schuko–Steckdosen anschliessen. Diese Schutzmassnahme darf nicht unwirksam gemacht werden (z B durch Verwendung einer Verlängerungsschnur ohne Schutzleiter).

Netzanschluss Das Gerät ist nur für Betrieb an Wechselspannung vorgesehen. Werksmässig ist es auf die Spannung 230 V oder 115 V eingestellt (Typenschild auf der Geräterückwand beachten!). Bei Bedarf also erst auf die örtliche Netzspannung umschalten. Der Netzanschluss muss den örtlichen Schutzvorschriften entsprechen. In jedem Fall ist aber Anschluss über eine Steckvorrichtung mit Schutzkontakten erforderlich; siehe oben unter »Erdung».

Spannungswahl und Sicherungen Das Gerät ist auf 115 V oder 230 V einstellber. In beiden Fällen sind flinke Sicherungen 1,6 A zu verwenden. Die Primärseite des Netztransformators ist zusätzlich durch eine auswechselbare Thermosicherung geschützt. Die Umschaltung wird wie folgt vorgenommen:

- Netzstecker ziehen
- Gehäuse abnehmen (siehe unten)
- Die Drähte am Netztransformator entsprechend der Skizze auf Seite 10 umlöten

2 Wartung und Reparatur

Fehler und Überbeanspruchung Bei Verdacht der Betriebsunsicherheit Gerät aus dem Betrieb nehmen. Dies kann der Fall sein bei sichtbaren Beschädigungen, Funktionsausfall oder übermässigen Beanspruchungen (Transport, Lagerung und dgl.).

Abnehmen des Gehäuses Beim Entfernen von Abdeckungen und Bauteilen können unter Spannung stehende Teile freigelegt werden. Vor dem Öffnen ist das Gerät daher von allen Spannungsquellen zu trennen. Abstimmung, Wartung oder Reparaturen unter Spannung dürfen nur von geschulten Fachkräften, die mit den Gefahren vertraut sind, vorgenommen werden. **Zu beachten!** Auch nach Spannungsunterbrechung sind geladene Kondensatoren noch für einige Zeit spannungführend (Schaltplan beachten!). Gehäuse wie folgt abnehmen:

- Netzstecker ziehen
- Die vier hinteren Schrauben lösen
- Gehäuseteile oben und unten abnehmen

Reparaturen und Auswechslung von Teilen Reparaturen sind nur von Fachkräften auszuführen. Die Bauweise des Geräts darf unter keinen Umständen für den Geräteschutz nachteilig geändert werden. Insbesondere dürfen die Kriechstrecken, Sicherheitsabstände und Isolierschichten keinesfalls beeinträchtigt werden. Nur Originalersatzteile verwenden! Andere Ersatzteile sind nur zulässig, sofern sich daraus keine Nachteile für den Geräteschutz ergeben.

Prescriptions de sécurité

A la livraison, cet appareil satisfait aux normes de sécurité en vigueur. Afin de le maintenir conforme à ces normes et d'assurer son fonctionnement dans de bonnes conditions de sécurité, il est recommandé de se conformer aux instructions ci-dessous.

1. Avant la mise en marche

Protection L'appareil est protégé conformément à la classe 1 (ligne de terre protectrice) des normes IEC 348 ou VDE 0411. Son câble secteur comporte une connexion de terre. A l'extérieur des locaux spécialement protégés, ne connecter la fiche secteur qu'à des prises dotées d'un contact de terre. Toute interruption de la connexion de terre à l'intérieur ou à l'extérieur de l'appareil est proscrite.

Installation L'appareil peut être utilisé dans n'importe quelle position en fonction des besoins de l'utilisateur. Ne pas le placer sur une surface produisant ou rayonnant de la chaleur, ni à la lumière solaire directe.

Misse à la terre Mettre l'appareil à la terre conformément aux normes de sécurité locales en vigueur. Le câble secteur livré avec l'appareil comprend un conducteur protecteur relié aux contacts de terre de la fiche. Lorsqu'il est branché à une prise secteur avec terre, l'appareil a ainsi son coffret relié à la ligne de terre protectrice, laquelle est connectée intérieurement à la prise BNC externe du coffret. Ne pas utiliser cette dernière pour connecter un conducteur de protection.

Attention Ne brancher la fiche du câble secteur qu'à des prises dotées de contacts de terre. Ne pas neutraliser cette protection en utilisant par exemple un prolongateur sans conducteur de terre.

Branchement au secteur N'alimenter l'appareil qu'en courant alternatif. A sa livraison, il est couplé pour 230 V ou 115 V suivant l'indication de la plaquette placée à sa partie arrière. Bien s'assurer qu'il est couplé sur la tension secteur locale avant de le mettre en marche. La connexion de l'appareil au secteur devant être effectuée conformément aux normes locales de sécurité, elle doit comporter une ligne de terre protectrice comme décrit au chapitre Mise à la terre.

Sélection du secteur et fusibles L'appareil peut être couplé pour 115 V ou 230 V. Dans les deux cas le fusible doit être 1.6 á action rapide, en sus de ca le côté principal du transformateur secteur est protégé par un fusible thermique démontable. Pour modifier le couplage de l'appareil, procéder de la manière suivante:

- Débrancher le cable Secteur
- Ouvrir l'appareil comme décrit au chapitre Ouverture
- Ressouder les fils du transformateur Secteur Conformément aux figures à la page 10

2. Maintenance et réparation

Défauts et contraintes sévères Si la sécurité de fonctionnement de l'appareil est jugée incertaine, le retirer du service. C'est notamment le cas lorsqu'il présente des dommages matériels ou ne fonctionne plus ou encore a été soumis à des contraintes hors tolérances, par exemple lors de l'entreposage ou du transport.

Ouverture de l'appareil Lors de l'enlèvement des capots ou autres parties au moyen d'outils, des organes ou des bornes sous tension peuvent se trouver exposés. Avant d'ouvrir l'appareil, le déconnecter par conséquent de toute source d'alimentation. Si l'appareil ouvert et sous tension nécessite un calibrage, une opération de maintenance ou une réparation, ne confier le travail qu'à du personnel qualifié et conscient des risques encourus. Après déconnexion des sources d'alimentation, les condensateurs de l'appareil peuvent rester chargés pendant quelques secondes, voir les schémas de connexions. Pour ouvrir l'appareil, procéder de la maniere suivante:

- Debrancher le câble Secteur
- Enlever les quatres vis du fond
- Tirer les coffrets du haut et du bas

Réparation et remplacement de pièces Les réparations doivent être effectuées par du personnel qualifié. S'assurer que la constitution de l'appareil n'est pas modifiée au détriment de la sécurité. Avant tout, les lignes de fuite, les entrefers et les revêtements isolants ne doivent pas être réduits. Pour tout échange, n'utiliser que des pièces détachées d'origine. Les autres pièces de rechange ne sont acceptables que si le niveau de sécurité de l'appareil reste inchangé.

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1. Introduction

The counters in the PM 6620-series have frequency ranges from dc up to 80 MHz, 520 MHz and 1 GHz respectively for the PM 6622, PM 6624 and PM 6625. All models can measure frequency, ratio, period, time interval and have a totalizing mode. Optional accessoires such as five different oscillators, a battery unit, a BCD output unit, a D/A converter and a BUS interface system extend the range of application.

2. Technical data

Properties expressed in numerical values with statement of tolerances are guaranteed. Numerical values without tolerances are intended for information purposes only and indicate the properties of an average instrument. The numerical values hold good for the nominal mains voltage.

Measurements

Frequency A

Range: dc to 80 MHz
Gate times: 10 ms, 100 ms, 1 s and 10 s
Resolution: 100 Hz, 10 Hz, 1 Hz and 0.1 Hz
Accuracy: ± 1 count ± time base error

Frequency C

Range PM 6624: 50 MHz to 520 MHz
Range PM 6625: 50 MHz to 1000 MHz
Gate times PM 6624: 10 ms, 100 ms, 1 s and 10 s automatically multiplied with prescaling factor 8
Gate times PM 6625: 10 ms, 100 ms, 1 s and 10 s automatically multiplied with prescaling factor 16
Resolution: 100 Hz, 10 Hz, 1 Hz and 0.1 Hz
Accuracy: ± 1 count ± time base error

Single Period B

Range: 100 ns to 10^5 s (dc to 10 MHz)
Resolution: 100 ns and 100 µs
Accuracy: ± 1 count ± time base error ± trigger error*
Frequency counted: 10 MHz and 10 kHz

Period Average B

Range: 1 Hz to 10 MHz
Periods averaged (N): 10^2, 10^4 and 10^6
Resolution: $\frac{100\text{ ns}}{N}$

Accuracy: ± 1 count ± time base error ± trigger error*/N.
Frequency counted: 10 MHz

1. Einleitung

Die Universalzähler der PM 6620-Serie eignen sich für Messungen in den Frequenzbereichen von Gleichspannung bis 80 MHz (PM 6622) bzw. 520 MHz (PM 6624) und 1 GHz (PM 6625). Mit allen Modellen ist die Messung von Frequenz, Frequenzverhältnis, Periodendauer, Zeitintervall sowie Ereigniszählung möglich. Der Anwendungsbereich kann durch Zusatzeinheiten wie fünf verschiedene Oszillatoren, eine Batterie-Einheit, einen BCD-Ausgang, einen D/A-Wandler und ein BUS-Interfacesystem noch wesentlich erweitert werden.

2. Technische Daten

In Zahlen mit Toleranzangabe ausgedrückte Eigenschaften sind Garantiewerte. Zahlen ohne Toleranzangabe dienen nur zur Information des Anwenders und stellen die Eigenschaften eines typischen Gerätes dar. Die Zahlenwerte gelten für Nenn-Netzspannung.

Messarten

Frequenz A

Bereich: 0 . . . 80 MHz
Meßzeiten: 10 ms, 100 ms, 1 s und 10 s
Auflösung: 100 Hz, 10 Hz, 1 Hz und 0,1 Hz
Genauigkeit: ± 1 digit ± Zeitbasisfehler

Frequenz C

Bereich PM 6624: 50 MHz . . . 520 MHz
Bereich PM 6625: 50 MHz . . . 1000 MHz
Meßzeiten PM 6624: 10 ms, 100 ms, 1 s und 10 s, automatisch multipliziert mit dem Vorteilerfaktor 8
Meßzeiten PM 6625: 10 ms, 100 ms, 1 s und 10 s, automatisch multipliziert mit dem Vorteilerfaktor 16.
Auflösung: 100 Hz, 10 Hz, 1 Hz und 0,1 Hz
Genauigkeit: ± 1 digit ± Zeitbasisfehler

Einzelperiode B

Bereich: 100 ns . . . 10^5 s (0 . . . 10 MHz)
Auflösung: 100 ns und 100 µs
Genauigkeit: ± 1 digit ± Zeitbasisfehler ± Triggerfehler*
Zählfrequenz: 10 MHz und 10 kHz

Periodendauer-Mittelwert B

Bereich: 1 Hz . . . 10 MHz
Mittelwertbildung über N Perioden: 10^2, 10^4 und 10^6
Auflösung: $\frac{100\text{ ns}}{N}$

1. Introduction

Les compteurs PM 6622, PM 6624, PM 6625 de la série PM 6620, offrent respectivement, des gammes de fréquence du continu à 80 MHz, 520 MHz, et 1 GHz.
Ils permettent tous trois de mesurer la fréquence, le rapport, la période l'intervalle de temps, et sont équipés d'un mode de totalisation. Les accessoires en option, tels que : cinq oscillateurs différents, une unité de batterie, une unité de sortie BCD, un convertisseur D/A et un interface BUS, permettent d'étendre la gamme d'applications.

2. Caractéristiques Techniques

Les caractéristiques exprimées en valeurs numériques avec mention de tolérances sont garanties. Les valeurs numériques sans mention de tolérance sont données à titre indicatif seulement, et ce, pour la moyenne des appareils. Les valeurs numériques sont valables pour une tension secteur nominale.

Mesures

Fréquence A

Gamme : continu à 80 MHz
Temps de porte : 10 ms, 100 ms, 1 s et 10 s
Résolution : 100 Hz, 10 Hz, 1 Hz et 0.1 Hz
Précision : ± 1 impulsion ± erreur de base de temps

Fréquence C

Gamme PM 6624 : 50 MHz à 520 MHz
Gamme PM 6625 : 50 MHz à 1000 MHz
Temps de porte PM 6624 : 10 ms, 100 ms, 1 s, et 10 s multipliés — automatiquement avec facteur de pré-étalonnage 8
Temps de porte PM 6625 : 10 ms, 100 ms, 1 s et 10 s multipliés — automatiquement avec facteur de pré-étalonnage 16
Résolution: 100 Hz, 10 Hz, 1 Hz, et 0.1 Hz
Précision : ± 1 impulsion ± erreur de base de temps

Période simple B

Gamme : 100 ns à 10^5 s (continu à 10 MHz)
Résolution : 100 ns et 100 µs
Précision : ± 1 impulsion ± erreur de base de temps ± erreur de déclenchement*
Fréquence comptée : 10 MHz et 10 KHz

Single Time Interval A to B

Range: 100 ns to 10^5 s
Resolution: 100 ns and 100 µs
Time interval repetition rate: maximum 5 MHz
Accuracy: ± 1 count ± time base error ± trigger error**
Frequency counted: 10 MHz and 10 kHz

Time Interval Average A to B

Range: 1 ns to 1 s
Frequency counted: 10 MHz
Periods averaged (N): 10^2, 10^4 and 10^6
Statistical resolution: 100 ns/$\sqrt{N}$
Minimum time from stop to start: 250 ns
Accuracy: ± 4 ns ± time base error $\pm \frac{\text{100 ns trigger error**}}{\sqrt{N}}$
Time Interval repetition rate: maximum 4 MHz

Count A (totalizing)

Range: 1 to 10^9
Mode: accumulates pulses between a start and stop pulse or during a gate signal applied to input B
Pulse pair resolution: 12 ns

Multiple Ratio

Ratio fA/fB: $\frac{\text{dc to 80 MHz}}{\text{dc to 10 MHz}}$

Ratio fC/fB PM 6624: $\frac{\text{50 to 520 MHz}}{\text{dc to 10 MHz}}$

Ratio fC/fB PM 6625: $\frac{\text{50 to 1000 MHz}}{\text{dc to 10 MHz}}$

Accuracy: ± 1 count ± trigger error* of B/N
Multiplier (N): 10^4 and 10^6 with correct decimal point
Ratio measurements with a multiplier factor: N = 10^5 to 10^8 are obtained in Frequency measurements. In Single Period and Period Average measurements multiplier factors of 1, 10^2, 10^4 and 10^6 can be obtained by using the external reference input.
This arrangement will not give correct decimal points.

Trigger Hold Off only PM 6622

Measuring modes: the trigger hold off (or trigger delay) works in Single Period and Single Time Interval modes.
Range: from less than 10 µs to 100 ms in two ranges.
Monitor output: the hold off time is

* Trigger error is $\leq \pm 3 \times 10^{-3}$ for sine wave signals with signal to noise ratio of ≥ 40 dB.
** Trigger error for any wave shape is $\leq \pm \frac{2.5 \times 10^{-3}}{\text{Signal slope (V/ns)}}$ ns.

Genauigkeit: ± 1 digit ± Zeitbasisfehler ± Triggerfehler*/N
Zählfrequenz: 10 MHz

Einzelzeitintervall A—B

Bereich: 100 ns . . . 10^5 s
Auflösung: 100 ns und 100 µs
Zeitintervall-Wiederholfrequenz: max. 5 MHz
Genauigkeit: ± 1 digit ± Zeitbasisfehler ± Triggerfehler*
Zählfrequenz: 10 MHz und 10 kHz

Zeitintervall-Mittelwert A—B

Bereich: 1 ns . . . 1 s
Zählfrequenz: 10 MHz
Mittelwertbildung über N Perioden: 10^2, 10^4 und 10^6
Statistische Auflösung: $\frac{\text{100 ns}}{\sqrt{N}}$

Mindestzeit zwischen Start und Stopp: 250 ns
Genauigkeit: ± 4 ns ± Zeitbasisfehler $\pm \frac{\text{100 ns ± Triggerfehler**}}{\sqrt{N}}$
Zeitintervall-Wiederholfrequenz: max. 4 MHz

Zählung A (Summenbildung)

Bereich: 1 . . . 10^9
Betrieb: Summiert Impulse zwischen einem Start- und einem Stoppsignal oder während eines Torsignals an Eingang B
Impulspaar-Auflösung: 12 ns

Frequenzverhältnis

Verhältnis fA/fB:
DC . . . 80 MHz/DC . . . 10 MHz
Verhältnis fC/fB (PM 6624):
50 . . . 520 MHz/DC . . . 10 MHz
Verhältnis fC/fB (PM 6625):
50 . . . 1000 MHz/DC . . . 10 MHz
Genauigkeit: ± 1 digit ± Triggerfehler* von B/N
Multiplikator (N): 10^4 und 10^6 mit korrektem Dezimalpunkt
Verhältnismessung mit einem Multiplikator: N = 10^5 bis 10^8 sind im Frequenz-Betrieb zu erhalten, während bei Messung von Periodendauer und Periodendauer-Mittelwert die Multiplikatoren 1, 10^2, 10^4 und 10^6 durch Verwendung des externen Referenzeingangs erhältlich sind.
Dieses Verfahren liefert jedoch keinen korrekten Dezimalpunkt.

* Der Triggerfehler beträgt höchstens ± 3 × 10^{-3} für Sinus bei einem Signal-Rauschverhältnis von min. 40 dB.
** Der Triggerfehler für beliebige Signalformen beträgt höchstens $\pm \frac{2{,}5 \times 10^{-3}}{\text{Signalflanke (V/ns)}}$ ns

Période moyenne B

Gamme : 1 Hz à 10 MHz
Périodes mises en moyenne (N) : 10^2, 10^4 et 10^6
Résolution : $\frac{\text{100 ns}}{N}$
Précision : ± 1 impulsion ± erreur de base de temps ± erreur de déclenchement*/N
Fréquence comptée : 10 MHz

Intervalle de temps simple A — B

Gamme : 100 ns à 10^5 s
Résolution : 100 ns et 100 µs
Taux de répétition d'intervalle de temps : Maximal de 5 MHz
Précision : ± 1 impulsion ± erreur de base de temps ± erreur de déclenchement**
Fréquence comptée : 10 MHz et 10 KHz

Moyenne d'intervalle de temps A — B

Gamme : 1 ns à 1 s
Fréquence comptée : 10 MHz
Périodes mises en moyenne (N) : 10^2, 10^4 et 10^6
Résolution statistique : 100 ns/$\sqrt{N}$
Temps minimal arrêt/démarrage : 250 ns
Précision : ± 4 ns ± erreur de base de temps ± 100 ns erreur de déclenchement**/$\sqrt{N}$
Taux de répétition d'intervalle de temps : Maximal de 4 MHz

Comptage A (totalisation)

Gamme : 1 à 10^9
Mode : accumule les impulsions pendant l'intervalle de temps entre le signal d'arrêt ou le signal de porte appliqué à l'entrée B
Résolution de paire d'impulsions : 12 ns

Rapport multiple

Rapport fA/fB :
continu à 80 MHz, continu à 10 MHz
Rapport fC/fB PM 6624 :
50 à 520 MHz, continu à 10 MHz
Rapport fC/fB PM 6625 :
50 à 1000 MHz, continu à 10 MHz
Multiplicateur (N) : 10^4 et 10^6 avec le point décimal correcte
Précision: ∓ 1 impulsion ∓ erreur* de déclenchement de B/N.

* L'erreur de déclenchement est $\leq \pm 3 \times 10^{-3}$ pour signaux sinusoïdaux avec rapport signal/bruit ≥40 dB.
** L'erreur de déclenchement pour chaque sinusoïde est $\leq \pm \frac{2{,}5 \times 10^{-3}}{\text{pente du signal (V/ns)}}$ ns

monitored on the Gate Open output and can be digitally measured by the instrument itself.

Check

Hold off not activated: 10 MHz is internally applied to channels A and B and a functional self test of any measuring mode can be made.
Hold off activated: the set Hold Off duration will be displayed if Single Period or Time Interval mode is selected.

Input characteristics

Inputs A and B

General: inputs A and B are identical but input B is functionally limited to 10 MHz
Frequency range: dc to 80 MHz at dc coupling and 100 Hz to 80 MHz at ac coupling
Rise time: approximately 4 ns
Pulse resolution: 6 ns minimum pulse duration
Sensitivity: 20 mV_{rms} and 200 mV_{rms} for sine wave signals, 60 mV_{p-p} and 600 mV_{p-p} for pulses
Impedance: 1 MΩ//25 pF
Trigger level: preset to 0 V or variable between ± 2.5 V and ± 25 V in two ranges with higher resolution around 0 V
Trigger level monitor: set trigger voltages from — 2.5 V to + 2.5 V are available on 1 mm jacks at the front
Trigger slope: positive and negative
Coupling: dc and ac
Safe overload at 20 mV sensitivity setting: 250 V dc or 230 V_{rms} for frequencies up to 440 Hz falling to 12 V_{rms} for frequencies of 1 MHz and higher
Safe overload at 200 mV sensitivity setting: 250 V dc or 230 V_{rms}
Switching mode: separate or common

Input C

Range: 50 MHz to 520 MHz for PM 6624 and 50 MHz to 1000 MHz for PM 6625
Prescaling factor: 8 for PM 6624 and 16 for PM 6625
Dynamic input voltage range: 10 mV_{rms} to 12 V_{rms} (— 27 dBm to + 35 dBm). Above 960 MHz the sensitivity of PM 6625 might drop to — 24 dBm (14 mV_{rms})
Impedance: 50Ω
Attenuation: continuous by automatic PIN diode attenuation, maximum 62 dB
Coupling: ac
VSWR: less than 2
AM tolerance: 98 % at modulation frequencies up to 5 kHz. 30 % at modulation frequencies of 1 MHz and higher.
Safe overload: 12 V_{rms}

Triggersperre (nur PM 6622)

Betrieb: Die Triggersperre (Triggerverzögerung) HOLD OFF arbeitet bei Messungen von Einzelperioden und Einzelzeitintervall.
Bereich: Von unter 10 µs bis 100 ms in zwei Bereichen.
Anzeige: Die Sperre wird am Ausgang GATE OPEN angezeigt und kann vom Instrument selbst digital gemessen werden.

Check

Triggersperre nicht betätigt: Ein 10-MHz-Signal wird intern an die Kanäle A und B angelegt. Dadurch ist eine funktionelle Eigenkontrolle jeder Meßfunktion möglich.
Triggersperre betätigt: Bei Messung von Periodendauer oder Zeitintervall wird die eingestellte Dauer der Triggersperre HOLD OFF angezeigt.

Eingangscharakteristika

Eingänge A und B

Allgemeines: Die Eingänge A und B sind identisch, nur ist die Funktion von Eingang B auf 10 MHz begrenzt.
Frequenzbereich: DC bis 80 MHz bei DC-Kopplung und 100 Hz bis 80 MHz bei AC-Kopplung
Anstiegszeit: ca. 4 ns
Impulsauflösung: min. Impulsdauer 6 ns
Empfindlichkeit: 20 mV_{eff} und 200 mV_{eff} für Sinussignale, 60 mV_{SS} und 600 mV_{SS} für Impulse
Impedanz: 1 MΩ//25 pF
Triggerpegel: Voreingestellt auf 0 V oder variabel zwischen ± 2,5 V und ± 25 V mit höherer Auflösung um 0 V
Triggerpegelanzeige: Eingestellte Triggerspannungen von — 2,5 V bis + 2,5 V können an Miniaturbuchsen auf der Frontseite abgenommen werden
Triggerflanke: Positiv und negativ
Kopplung: DC und AC
Überlastungsschutz bei 20 mV: 250 V DC oder 230 V_{eff} bei Frequenzen von bis zu 440 Hz, abfallend auf 12 V_{eff} bei 1 MHz oder mehr
Überlastungsschutz bei 200 mV: 250 V DC oder 230 V_{eff}
Schaltart: Gemeinsam oder getrennt

Eingang C

Bereich: 50 MHz bis 520 MHz (PM 6624) bzw. 50 MHz bis 1000 MHz (PM 6625)
Vorteilerfaktor: 8 für PM 6624 und 16 für PM 6625
Dynamischer Eingangsspannungsbereich: 10 mV_{eff} bis 12 mV_{eff} (— 27 dBm bis + 35 dBm). Über 960 MHz

Mesures de rapport avec un facteur multiplicateur : N = 10^5 à 10^8 sont obtenus en mesures de fréquence. Pour les mesures en Période Simple et Période moyenne les facteurs multiplicateurs de 1, 10^2, 10^4 et 10^6 peuvent être obtenus en utilisant une entrée de référence externe.
Toutefois, cet arrangement ne fournira pas de points décimaux correctes.

Déclenchement HOLD OFF seulement PM 6622

Modes de mesures : le déclencheur Hold Off fonctionne en mode de — Période Simple et en mode d'intervalle de temps simple.
Sortie contrôle : le temps de retard est commandé sur la sortie de porte ouverte et peut être mesuré digitalement par l'instrument lui-même.
Gamme: moins que 10 µs 0 100 ms en deux gammes

Vérification

Hold Off non-déclenché : 10 MHz est appliqué intérieurement aux voies A et B et un auto-contrôle fonctionnel peut être effectué selon n'importe quel mode de mesure
Hold Off Déclenché : la durée réglée de Hold Off sera affichée après la sélection de soit le mode de Période Simple, ou le mode d'intervalle de temps.

Caractéristiques d'Entrée

Entrées A et B

Généralités : les entrées A et B sont identiques mais, l'entrée B est limitée à une fonction de 10 MHz
Gamme de fréquence : continu à 80 MHz avec couplage en continu, et — 100 Hz à 80 MHz avec couplage capacitif
Temps de montée : approximativement 4 ns
Résolution des impulsions : durée minimum de 6 ns par impulsion
Sensibilité : 20 mV_{eff} et 200 mV_{eff} pour les signaux d'ondes sinusoïdales 60 mV_{c-c} et 600 mV_{c-c} pour les impulsions
Impédance : 1 M-ohm//25 pF
Niveau de déclenchement : préréglé sur 0 V ou variable entre ± 2.5 V et ± 25 V en deux gammes avec une résolution supérieure près de 0V
Commande du niveau de déclenchement : des tensions de déclenchement réglées de — 2.5 V à + 2.5 V sont obtenues sur les bornes avant
Pente de déclenchement : positive et négative
Couplage : continu ou capaciti

External reference input D

General: channel D is switchable between external reference frequency input and internal reference oscillator output
Frequency range: 1 kHz to 10 MHz with correct decimal point at 10 MHz
Sensitivity: 500 mV_{rms}
Impedance: approximately 10 kΩ
Coupling: ac
Safe overload: 50 V_{rms}

External reset and start

Reset: via a 0 V ±0.4 V signal applied to the input socket
Minimum time between trailing edge and start of new measurement: 200 ns
Minimum reset pulse duration: 100 ns
Input current: at 0.4 V maximum 0.4 mA
Start of new measurement: when the input is returned to a voltage of more than +2.5 V (max. 5.5 V) or left open the counter is released to carry out a new measurement. If the Display Time Control is set to infinite position only one new measurement is made and stored and the counter can not start a new measurement until a new reset pulse has been applied.

Output characteristics

Time base oscillator output D

General: channel D is switchable between external reference frequency input and time base oscillator output
X-tal frequency: 10 MHz
Amplitude: approximately 1 V_{rms}, open circuit
Impedance: approximately 200 Ω
Coupling: dc
Safe overload: short circuit proof

Gate monitor output

General: the gate monitor output enables observation on an oscilloscope of the measured interval (and the hold off time on the PM 6622)
Output level during open main gate: less than 0.4 V
Output level during closed main gate: more than 2.5 V
Output level during hold off time: approximately 1.5 V
Output impedance: approximately 400Ω
Delay: internal delay between the signal inputs and the trigger monitor output is approximately 65 ns
Overload protection: short circuit proof

General characteristics

Display

Read out: planar 9 digits 7 segments gas discharge display with automatic decimal point

kann die Empfindlichkeit des PM 6625 auf — 24 dBm (14 mV_{eff}) abfallen
Impedanz: 50 Ω
Dämpfung: Kontinuierlich durch automatischen PIN-Dioden-Abschwächer, max. 62 dB
Kopplung: AC
VSWR: Unter 2
AM-Toleranz: 98% bei Modulationsfrequenzen bis zu 5 kHz. 30% bei Modulationsfrequenzen von 1 MHz und mehr
Überlastungsschutz: 12 V_{eff}

Externer Referenzeingang D

Allgemeines: Der Kanal D ist umschaltbar zwischen externem Referenzfrequenz-Eingang und internem Referenz-Oszillator-Ausgang
Bereich: 1 kHz bis 10 MHz mit korrektem Dezimalpunkt bei 10 MHz
Empfindlichkeit: 500 mV_{eff}
Impedanz: ca. 10 kΩ
Kopplung: AC
Überlastschutz: 50 V_{eff}

Externes Rückstell-/Startsignal

Rückstellung: über ein 0 ± 0,4 V-Signal am Eingang
Mindestzeit zwischen Rückflanke und Beginn der neuen Messung: 200 ns
Min. Rückstellimpulsdauer: 100 ns
Eingangsstrom: max. 0,4 mA bei 0,4 V
Start einer neuen Messung: Wird der Eingang auf über + 2,5 V (max. 5,5 V) rückgestellt oder offen gelassen, so wird der Zähler für eine neue Messung freigegeben. Steht die Anzeigezeit auf unendlich, wird nur eine Messung durchgeführt und gespeichert. Der Zähler ist dann bis zum Anlegen eines neuen Rückstellsignals gesperrt.

Ausgangscharakteristika

Zeitbasis-Oszillator, Ausgang D

Allgemeines: Der Kanal D ist umschaltbar zwischen externem Referenzfrequenz-Eingang und internem Zeitbasis-Oszillator-Ausgang
Ausgangsfrequenz: 10 MHz
Amplitude: ca. 1 V_{eff} bei Leerlauf
Impedanz: 200 Ω
Kopplung: DC
Überlastschutz: kurzschlussfest

Gate-Monitor-Ausgang

Allgemeines: Der Gate-Monitor-Ausgang ermöglicht es, das gemessene Zeitintervall (und die Triggerverzögerung beim PM 6622) auf einem Ozilloskop zu überwachen.
Ausgangspegel bei offenem Haupttor: unter 0,4 V
Ausgangspegel bei geschlossenem Haupttor: über 2,5 V
Ausgangspegel während Triggerverzögerung: ca. 1,5 V

Protection de surchage ; pour réglage de sensibilité à 20 mV : 250 V continu ou 230 V_{eff} pour les fréquences montant jusqu'à 440 Hz, tombant ensuite à 12 V_{eff} pour les fréquences de 1 MHz à monter
Protection de surcharge pour réglage de sensibilité à 200 mV : 250 V continu ou 230 V_{eff}
Modes d'entrée : séparée ou commune

Entrée C

Gamme : 50 MHz à 520 MHz pour PM 6624 et 50 MHz à 1000 MHz pour PM 6625
Facteur de pré-étalonnage : 8 pour PM 6624, et 16 pour PM 6625
Gamme de tension dynamique d'entrée: 10 mV_{eff} à 12 mV_{eff} (— 27 dBm à + 35 dBm). Audessus de 960 MHz la sensibilité pourrait baisser jusqu'à — 24 dBm, 14 mV_{eff}
Impédance : 50 ohm
Atténuation : par atténuateur à diodes PIN automatique, 62 dB maximum
Couplage : capacitif
Taux d'ondes stationnaires (VSWR) : < 2
Tolérance AM : 98 % en modulation de fréquence allant jusqu'à 5 kHz, 30 % en modulation de fréquence de 1 MHz à monter
Protection de surcharge : 12 V_{eff}

Entrée de référence externe D

Généralité : la voie D est commutable entre l'entrée externe à fréquence de référence, et la sortie de l'oscillateur à référence interne
Gamme de fréquence : 1 kHz à 10 MHz avec point décimal correcte à 10 MHz
Sensibilité : 500 mV_{eff}
Impédance : approximativement 10 kohm
Couplage : capacitif
Protection de surcharge : 50 V_{eff}

Remise à zéro/Démarrage externe

Remise à zéro : via un signal de 0 V ± 0.4 V appliqué à l'entrée EXT. RESET
Temps minimum entre la suite d'un affichage et le démarrage d'une nouvelle mesure : 200 ns
Durée minimum de l'impulsion de remise : 100 ns
Courant d'entrée : 0,4 mA max. à 0,4 V
Démarrage d'une nouvelle mesure : quand l'entrée est remise à une tension supérieure à + 2.5 V (5.5 V max.) ou que l'entrée est maintenue ouverte, une nouvelle mesure est alors démarrée. Si la commande DISPLAY TIME est réglée pour un temps d'affichage infini, alors une seule nouvelle mesure est démarrée et stockée. Le compteur ne peut pas alors faire démarrer une nou-

Unit annunciators: kHz, MHz, ms and ns
Display time: 50 ms to 4 s and infinite
Reset: pushing "Reset" resets the counter, releasing it starts new measurement
Gate lamp: indicates that main gate is open and counting takes place. In the Stand By position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.
Memory: display storage holds reading between samples and can be switched off by front panel "Memory" push-button
Trigger indicator: tri state LED with stretched operation (channels A and B). Light on indicates too high trigger level, light off too low trigger level and blinking indicates that triggering occurs.

Power requirements

Line voltage: 115/230 V ±15 %
Line frequency: 45 to 440 Hz
Consumption: depending on type no, crystal oscillator and options. Approximately 15 VA.
Mains interference: below Class II CENELEC/CISPR
Internal battery: PM 9673, power consumption approximately 8 W
External battery: 11.8 to 28 V, power consumption approximately 8 W. 4 mm banana connectors.
Oven oscillator: power consumption 100 mA in Stand By position

Environmental conditions

Storage temperature: —40°C to +70°C
Operating temperature: 0°C to +50°C
Storage altitude: 15000 m (15.2 kN/m²)
Operating altitude: 5000 m (53.3 kN/m²)
Humidity: 10 to 90 % RH (26°C dew point)
Vibration test: IEC 68 Fc
Bump test: IEC 68 Eb
Handling test: IEC 68 Ec
Transport test: NLN-L88

Dimensions and Weight

Width: 210 mm (8.25")
Height: 89 mm (3.5")
Depth: 325 mm (12.8")
Weight: 2.8 kg (6.2 lb)

3. Options

Standard oscillator PM 9677

Frequency: 10 MHz
Trimming range: more than ±200 Hz
Output voltage into 1 kΩ: more than 300 mV
Supply voltage: 12 V
Consumption: less than 100 mW at 25°C

Ausgangsimpedanz: ca. 400 Ω
Verzögerung: Die interne Verzögerung zwischen den Signaleingängen und dem Triggermonitor-Ausgang beträgt ca. 65 ns.
Überlastungsschutz: kurzschlußfest.

Allgemeine Daten

Anzeige

Ablesung: Planar, 9 Stellen; 7-Segment-Gasentladungsröhren mit automatischem Dezimalpunkt
Einheitenangabe: kHz, MHz, ms und ns
Anzeigedauer: 50 ms bis 4 s und unbegrenzt
Rückstellung: Drücken des Knopfes RESET stellt den Zähler auf Null zurück. Durch Loslassen wird eine neue Zählung gestartet.
GATE Lampe: Zeigt an, daß das Haupttor offen ist und eine Zählung stattfindet. In der Stellung STAND BY zeigt die Lampe GATE an, daß Netz oder Batterie anliegen, um den Quarz-Oszillator zu stabilisieren.
Speicher: Die Anzeigespeicherung hält die Anzeige zwischen Meßvorgängen. Sie läßt sich durch die frontseitige Drucktaste MEMORY abschalten.
Triggeranzeige: Tristabile LED-Kontrollampen (Kanal A und B). Lampe EIN zeigt zu hohen und Lampe AUS zu niedrigen Triggerpegel an. Bei Triggerung Blinklicht.

Speisung

Netzspannung: 115/230 V ± 15 %
Netzfrequenz: 45 bis 440 Hz
Leistungsaufnahme: Abhängig von Typennr., Quarzoszillator und Zubehör; ca. 15 VA
Netzstörungen: unter Class II CENELEC/CISPR
Interne Batterie: PM 9673, Leistungsverbrauch ca. 8 W
Externe Batterie: 11,8 bis 28 V, Leistungsverbrauch ca. 8 W; 4-mm-Bananenstecker
Geheizter Oszillator: Verbrauch 100 mA in Bereitschaftsbetrieb (Stand by)

Umgebungsbedingungen

Lagertemperatur: —40°C bis +70°C
Betriebstemperatur: 0°C bis +50°C
Lagerhöhe: 15000 m (15,2 kN/m²)
Betriebshöhe: 5000 m(53,3 kN/m²)
Feuchtigkeit: 10 bis 90 % rel. Luftfeuchtigkeit (Taupunkt 26°C)
Vibrationsfestigkeit: nach IEC 68 Fc
Stoßfestigkeit: nach IEC 68 Eb
Bedienungstest: nach IEC 68 Ec
Transporttest: nach NLN-88

velle mesure jusqu'à ce qu'une nouvelle impulsion de remise soit appliquée

Caractéristiques de sortie

Sortie oscillateur base de temps D

Généralités : la voi D est commutable entre l'entrée externe de la fréquence de référence et la sortie de l'oscillateur base de temps
Fréquence cristal : 10 MHz
Amplitude : approx. 1 V_{eff} à circuit ouvert
Impédance : approx. 200 ohm
Couplage : alternatif
Protection de surcharge : contre les court-circuits

Sortie témoin de porte

Généralités : la sortie témoin de porte permet l'observation sur un oscilloscope d'un intervalle mesuré, (ainsi que le temps de retard sur le PM 6622)
Niveau de sortie en porte principale ouverte : < 0.4 V
Niveau de sortie en porte principale fermée : > 2.5 V
Niveau de sortie en temps de retard : approx. 1.5 V
Sortie impédance : approx. 400 ohm
Retard : le retard interne entre les signaux d'entrée et la sortie témoin du déclenchement est approx. de 65 ns
Protection de surcharge : contre les court-circuits

Caractéristiques Générales

Affichage

Sortie lecture : 9 chiffres, affichage à 7 segments, (gaz), et avec point décimal automatique
Indicateurs d'unités : kHz, MHz, ms et ns
Temps d'affichage : 50 ms à 4 s et infini
Remise à zéro : la commande "RESET" enfoncée, remet le compteur à zéro, et en position relâchée une nouvelle mesure démarre
Lampe de porte : Indique que la porte principale est ouverte et que le comptage a lieu ; en position d'attente, la lampe de porte indique que la tension secteur ou la batterie est appliquée en vue de la stabilisation de l'oscillateur cristal
Mémoire : l'affichage retient la lecture entre les informations et peut être grâce au bouton-poussoir "Memory" sur le panneau avant
Indicateur de déclenchement : LED tri-à opération prolongée (voies A et B). Lorsque la lampe est allumée en permanence, le niveau de déclenchement est trop élevé, lorsque la lampe est éteinte en permanence, le niveau de

Ageing: less than 5×10^{-7} per month
Temperature deviation 0°C to 50°C: less than 1×10^{-5} with reference to +25°C
Change in measuring and supply mode: less than 3×10^{-7}
Line voltage ± 10 % deviation: less than 1×10^{-8}
Environmental data: same as the counter
Dimension: 93×50×20 mm
Weight: 50 g

TCXO PM 9678

Frequency: 10 MHz
Trimming range: more than ±20 Hz will cover at least 10 years of operation
Output voltage into 1kΩ: more than 100 mV
Supply voltage: 12 V
Consumption: less than 200 mW at 25°C
Ageing: less than 1×10^{-7}/month, the ageing will decrease substantially after the first 6 months
Temperature deviation 0°C to 50°C: less than 1×10^{-6} with reference to +25°C
Change in measuring and supply mode: less than 5×10^{-8}
Line voltage ± 10 % deviation: less than 1×10^{-9}
Environmental data: same as the counter
Dimensions: 93×50×15 mm
Weight: 25 g

Oven oscillator PM 9679B

Frequency: 10 MHz
Trimming range: + 20 Hz and — 30 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years
Output voltage into 1 kΩ: more than 150 mV
Supply voltage: + 11.5 to 28 V from unregulated power supply
Consumption at continuous operation and stand by: less than 125 mA
Warm up consumption: less than 400 mA
Ageing: less than 1×10^{-7}/month after 72 hours of continuous operation
Temperature deviation (0°C to 50°C): less than 1×10^{-7} with reference to 25°C
Line voltage (± 10 % deviation): less than 1×10^{-9}
Change in measuring and supply mode: less than 1×10^{-8}
Warm upp time: less than 15 minutes to reach 1×10^{-7}
Environmental data: same as the counter
Dimension: 100 × 52 × 35 mm
Weight: 100 g

Abmessungen und Gewicht

Breite: 210 mm
Höhe: 89 mm
Tiefe: 325 mm
Gewicht: 2,8 kg

3. Zubehör

Standard Oszillator PM 9677

Frequenz: 10 MHz
Abstimmbereich: mehr als ± 200 Hz
Ausgangsspannung an 1 kΩ: mehr als 300 mV
Speisespannung: 12 V
Verbrauch: unter 100 mW bei 25°C
Alterung: unter 5×10^{-7} pro Monat
Temperaturabweichung 0°C bis 50°C: unter 1×10^{-5} bezogen auf +25°C
Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 3×10^{-7}
Netzspannung ± 10 %: unter 1×10^{-8}
Umgebungsbedingungen: wie der Zähler
Abmessungen: 93×50×20 mm
Gewicht: 50 g

TCXO PM 9678

Frequenz: 10 MHz
Abstimmbereich: über ± 20 Hz; ausreichend für min. 10 Betriebsjahre
Ausgangsspannung an 1 kΩ: über 100 mV
Speisespannung: 12 V
Verbrauch: unter 200 mW bei 25°C
Alterung: unter 1×10^{-7} pro Monat; nach den ersten sechs Monaten nimmt die Alterung bedeutend ab.
Temperaturabweichung 0°C bis 50°C: unter 1×10^{-6} bezogen auf +25°C
Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 1×10^{-8}
Netzspannung ± 10 %: unter 1×10^{-9}
Umgebungsbedingungen: wie der Zähler
Abmessungen: 93×50×15 mm
Gewicht: 25 g

Geheizter Oszillator PM 9679B

Frequenz: 10 MHz
Abstimmbereich: + 20 Hz und — 30 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen
Ausgangsspannung an 1 kΩ: über 150 mV
Speisespannung: + 11,5 bis 28 V aus nichtstabilisierter Speisung
Verbrauch bei Dauerbetrieb und Stand by: unter 125 mA
Verbrauch bei Anheizung: unter 400 mA
Alterung: unter 1×10^{-7} pro 24 h nach 72 Stunden Dauerbetrieb
Temperaturabweichung 0°C bis 50°C: unter 1×10^{-7} bezogen auf +25°C
Netzspannung ± 10 %: unter 1×10^{-9}
Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 1×10^{-8}

déclenchement est trop bas, et quand la lampe clignote, le déclenchement est effectué

Consommation

Tension secteur : 115/230 V ± 15 %
Fréquence secteur : 45 à 440 Hz
Consommation : selon le numéro du modèle, l'oscillateur cristal et les options (approx. 15 VA)
Interférence secteur : Audessous de class II SENELEC CISPR
Batterie interne : PM 9673, Consommation approx. 8 W
Batterie externe : 11.8 à 28 V avec une consommation d'environ 8 W, Connecteurs de 4 mm, type banane
Oscillateur à enceinte thermostatée : consommation de 100 mA en position d'attente

Caractéristiques d'environnement

Température de stockage : — 40° C à + 70° C
Température de fonctionnement : 0° C à + 50° C
Altitude de stockage : 15000 m (15.2 kN/m²)
Altitude de fonctionnement : 5000 m (53.3 kN/m²)
Humidité : 10 à 90 % RH (26° C point requis)
Epreuve à la vibration : conforme à la norme IEC 68 Fc
Epreuve au choc : conforme à la norme IEC 68 Eb
Epreuve manipulation : conforme à la norme IEC 68 Ec
Epreuve transportation : conforme à la norme NLN-L88

Dimensions et poids

Largeur : 210 mm (8.25″)
Hauter : 89 mm (3.5″)
Profondeur : 325 mm (12.8″)
Poids : 2.8 Kg (6.2 lb)

3. Options

Oscillateur standard PM 9677

Fréquence : 10 MHz
Gamme d'ajustement : supérieure à ± 200 Hz
Tension de sortie sous 1 k-ohm : supérieure à 300 mV
Tension d'alimentation : 12 V
Consommation : inférieure à 100 mW pour 25 C
Usure : inférieure à 5×10^{-7} pour un mois
Déviation de température de 0° C à 50° C : inférieure à 1×10^{-5} par rapport à + 25° C
Variation de la mesure et du mode d'alimentation : inférieure à 3×10^{-7}
Déviation ± 10 % de la tension secteur : inférieure à 1×10^{-8}

Oven oscillator PM 9690

Frequency: 10 MHz
Trimming range: +3 Hz and —7 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years
Output voltage into 1kΩ: more than 150 mV
Supply voltage: +11.5 to 28 V from unregulated power supply
Consumption at continuous operation and stand by: less than 125 mA
Warm up consumption: less than 400 mA
Ageing: less than 1.5×10^{-9}/24 h after 72 hours of continuous operation
Temperature deviation 0°C to 50°C: less than 3×10^{-8} with reference to + 25°C
Line voltage ± 10 % deviation: less than 5×10^{-10}
Change in measuring and supply mode: less than 3×10^{-9}
Warm up time: less than 15 minutes to reach 1×10^{-7}
Environmental data: same as the counter
Dimensions: 100×52×35 mm
Weight: 100 g

Oven oscillator PM 9691

Frequency: 10 MHz
Trimming range: + 3 Hz and — 7 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years
Output voltage into 1 kΩ: more than 150 mV
Supply voltage: + 11.5 to 28 V from unregulated power supply
Consumption at continuous operation and stand by: less than 125 mA
Warm up consumption: less than 400 mA
Ageing: less than 5×10^{-10}/24 h after 72 hours of continuous operation
Temperature deviation (0°C to 50°C): less than 5×10^{-9} with reference to + 25°C
Line voltage (± 10 % deviation): less than 5×10^{-10}
Change in measuring and supply mode: less than 3×10^{-9}
Warm up time: less than 15 minutes to reach 1×10^{-7}
Environmental data: same as the counter
Dimension: 100 × 52 × 35 mm
Weight: 100 g

Rack mount adapter

PM 9669/01: 19″ rack for one counter
PM 9669/02: 19″ rack for two counters

Battery unit

PM 9673: rechargeable battery for inside mounting

Anheizdauer: unter 15 Minuten, um 1×10^{-7} zu erreichen
Umgebungsbedingungen: wie der Zähler
Abmessungen: 100 × 52 × 35 mm
Gewicht: 100 g

Geheizter Oszillator PM 9690

Frequenz: 10 MHz
Abstimmbereich: +3 Hz und —7 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen
Ausgangsspannung an 1 kΩ: über 150 mV
Speisespannung: +11,5 bis 28 V aus nichtstabilisierter Speisung
Verbrauch bei Dauerbetrieb und Stand by: unter 125 mA
Verbrauch bei Anheizung: unter 400 mA
Alterung: unter $1,5\times10^{-9}$ pro 24 h nach 72 Stunden Dauerbetrieb
Temperaturabweichung 0°C bis 50°C: unter 3×10^{-8} bezogen auf + 25°C
Netzspannung ± 10 %: unter 5×10^{-10}
Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 3×10^{-9}
Anheizdauer: unter 15 Minuten, um 1×10^{-7} zu erreichen
Umgebungsbedingungen: wie der Zähler
Abmessungen: 100×52×35 mm
Gewicht: 100 g

Geheizter Oszillator PM 9691

Frequenz: 10 MHz
Abstimmbereich: + 3 Hz und — 7 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen
Ausgangsspannung an 1 kΩ: über 150 mV
Speisespannung: + 11,5 bis 28 V aus nichtstabilisierter Speisung
Verbrauch bei Dauerbetrieb und Stand by: unter 125 mA
Verbrauch bei Anheizung: unter 400 mA
Alterung: unter $1,5\times10^{-10}$ pro 24 h nach 72 Stunden Dauerbetrieb
Temperaturabweichung 0°C bis 50°C: unter 3×10^{-9} bezogen auf + 25°C
Netzspannung ± 10 %: unter 5×10^{-10}
Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 3×10^{-9}
Anheizdauer: unter 15 Minuten, um 1×10^{-7} zu erreichen
Umgebungsbedingungen: wie der Zähler
Abmessungen: 100 × 52 × 35 mm
Gewicht: 100 g

Adapter für Einbaumontage

PM 9669/01: 19″-Gehäuse für 1 Zähler
PM 9669/02: 19″-Gehäuse für 2 Zähler

Batteriesatz

PM 9673: Wiederaufladbare Batterie zur Montage im Zähler

Caractéristiques d'environnement : comme celles du compteur
Dimension : 93 × 50 × 20 mm
Poids : 50 g

TCXO PM 9678

Fréquence : 10 MHz
Gamme d'ajustement : supérieure à ± 20 Hz, pouvant servir pendant au moins dix ans
Tension de sortie sous 1 k-ohm : supérieure à 100 mV
Tension d'alimentation : 12 V
Consommation : inférieure à 200 mW à 25° C
Usure : inférieure à 1×10^{-7} par mois, et diminuera substantiellement après les premiers six mois
Déviation de température de 0° C à 50° C : inférieure à 1×10^{-6} par rapport à + 25° C
Variation de la mesure et du mode d'alimention : inférieure à 5×10^{-8}
Déviation ± 10 % de la tension secteur : inférieure à 1×10^{-9}
Caractéristiques d'environnement : Identiques à celles du compteur
Dimension : 93 × 50 × 15 mm
Poids : 25 g

Oscillateur à enceinte thermostatée PM 9679B

Fréquence : 10 MHz
Gamme d'ajustement : + 20 Hz et — 30 Hz avec réglage fin. Un dispositif d'ajustement ordinaire est disponible pour suppléer à un usage de plus de dix ans
Tension de sortie sous 1 k-ohm : supérieure à 150 mV
Tension d'alimentation : + 11.5 à 28 V non-régulée
Consommation en opération continuelle et en position d'attente : inférieure à 100 mA
Consommation au chauffage : inférieure à 400 mA
Usure : inférieure à 1×10^{-7}/24 h après 72 heures d'opération continuelle
Déviation de température de 0° C à 50° C : inférieure à 1×10^{-7} par rapport à + 25° C
Déviation ± 10 % tension secteur : inférieure à 1×10^{-9}
Variation de la mesure et du mode d'alimentation : inférieure à 1×10^{-8}
Temps de chauffage : inférieure à 15 minutes pour atteindre 1×10^{-7}
Caractéristiques d'environnement : Identiques à celles du compteur
Dimensions : 100 × 52 × 35 mm
Poids : 100 g

Oscillateur à enceinte thermostatée PM 9690

Fréquence : 10 MHz
Gamme d'ajustement : + 3 Hz et — 7 Hz avec réglage fin. Un dispositif d'ajuste-

Carrying case
PM 9672: carrying case for the counter and measuring leads during transportation

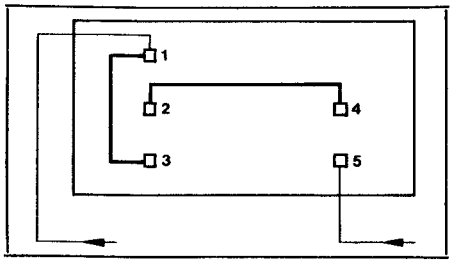
Output interface units
PM 9674: BCD output unit
PM 9675: digital to analog converter
PM 9676: bus interface unit

Accessories included with the instrument
Operation and service manual
Line cord
Front panel protective cover

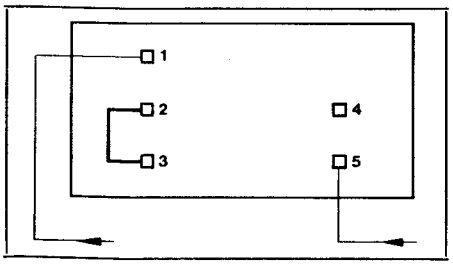
4. Installation

Mains voltage conversion: the counter can be converted into two mains voltage ranges, 100 to 130 V and 200 to 260 V.
The frequency range is 45 to 440 Hz.
At delivery the instrument is set to the 200 to 260 V range.
When changing to the 100 to 130 V range the connections of the mains transformer should be changed as shown in the figure below, and the "230 V" label covered with the "115 V" label supplied.

115 V



230 V



Earthing: the counter can be earthed via the protective earth terminal at the rear panel or via a three core mains cable plugged into an outlet with protective earth contact.
Use only one of these alternatives to avoid hum.

Fuses: a thermal fuse on the mains transformer and a 1.6 A fast action fuse are protecting the power supply.

Options: refer to installation instruction for each type number.

Tragtasche
PM 9672: Tragtasche für Gerät und Meßkabel

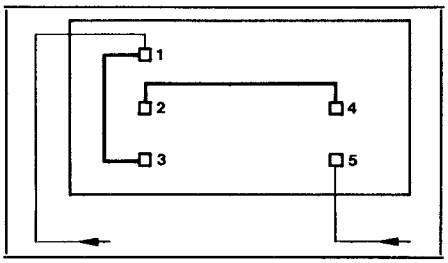
Ausgangs-/Interface-Einheiten
PM 9674: BCD-Ausgangseinheit
PM 9675: Digital-/Analogwandler
PM 9676: BUS-Interface

Mitgeliefertes Zubehör
Handbuch
Netzkabel
Frontplatten-Schutzdeckel

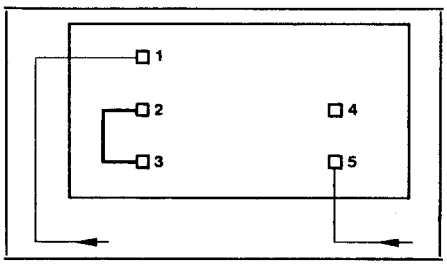
4. Installation

Netzspannungsänderung: Das Gerät läßt sich auf zwei Netzspannungsbereiche, 100—130 V und 200—260 V umschalten. Der Frequenzbereich ist 45 bis 440 Hz. Bei Lieferung ist der Zähler auf 200—260 V eingestellt.
Die Umschaltung auf 100—130 V geschieht durch Änderung der Anschlüsse des Netztransformators entspr. untenstehender Abbildung. Das Schild „230 V" ist dann mit dem Schild „115 V" zu überkleben.

115 V



230 V



Erdung: Das Gerät ist entweder über die Schutzerdungsklemme auf der Rückseite oder über den Schutzleiter des Netzkabels (nur an Schutzkontakt-Steckdose anschließen!) zu erden.
Nur eine dieser Erdungsmöglichkeiten verwenden, um Brummen zu vermeiden.

Sicherungen: Der Netzteil ist durch eine thermische Sicherung am Netztrafo und eine flinke 1,6-A-Sicherung geschützt.

Zubehör: Anleitungen zur Installation enthält das jeweilige Handbuch.

ment ordinaire est disponible pour suppléer à un usage de plus de dix ans
Tension de sortie sous 1 k-ohm : supérieure à 150 mV
Tension d'alimentation : + 11.5 à 28 V non-régulée
Consommation en opération continuelle et en position d'attente : inférieure à 125 mA
Consommation au chauffage : inférieure à 400 mA
Usure : inférieure à 1.5×10^{-9}/24 h après 72 heures d'opération continuelle
Déviation de température de 0° C à 50° C : inférieure à 3×10^{-8} par rapport à + 25° C
Déviation ± 10 % tension secteur : inférieure à 5×10^{-10}
Variation de la mesure et du mode d'alimentation : inférieure à 3×10^{-9}
Temps de chauffage : inférieure à 15 minutes pour atteindre 1×10^{-7}
Caractéristiques d'environnement : Identiques à celles du compteur
Dimensions : 100 × 52 × 35 mm
Poids : 100 g

Oscillateur à enceinte thermostatée PM 9691
Fréquence : 10 MHz
Gamme d'ajustement : + 3 Hz et —7 Hz avec réglage fin. Un dispositif d'ajustement ordinaire est disponible pour suppléer à un usage de plus de dix ans
Tension de sortie sous 1 k-ohm : supérieure à 150 mV
Tension d'alimentation : + 11.5 à 28 V non-régulée
Consommation en opération continuelle et en position d'attente : inférieure à 125 mA
Consommation au chauffage : inférieure à 400 mA
Usure : inférieure à 1.5×10^{-10}/24 h après 72 heures d'opération continuelle
Déviation de température de 0° C à 50° C : inférieure à 3×10^{-9} par rapport à + 25° C
Déviation ± 10 % tension secteur : inférieure à 5×10^{-10}
Variation de la mesure et du mode d'alimentation : inférieure à 3×10^{-9}
Temps de chauffage : inférieure à 15 minutes pour atteindre 1×10^{-7}
Caractéristiques d'environnement : Identiques à celles du compteur
Dimensions : 100 × 52 × 35 mm
Poids : 100 g

Adapteur pour montage Rack
PM 9669/01 : rack 19″ pour un compteur
PM 9669/02 : rack 19″ pour deux compteurs

Batterie
PM 9673 : batterie rechargeable pour montage interne

Valise

PM 9672 : une malette pour le compteur et pour les cordons de mesure

Unités interface de sortie

PM 9674 : unité de sortie BCD
PM 9675 : convertisseur digital/ analogique
PM 9676 : unité interface bus

Accessoires livrés avec l'appareil

Notice d'emploi et d'entretien
Cordon secteur
Couverture de protection pour panneau avant

4. Installation

Adaption secteur : le compteur peut être adapté à deux gammes de tension secteur, de 100 à 130 V et de 200 à 260 V.
La gamme de fréquence est de 45 à 440 Hz.
A la livraison, l'appareil est adapté pour la gamme de 200 à 260 V.

Pour adapter à une gamme de 100 à 130 V, modifier les connexions du transformateur secteur conformément à la figure ci-dessous et coller une étiquette de "115 V" à la place de celle de "230 V".

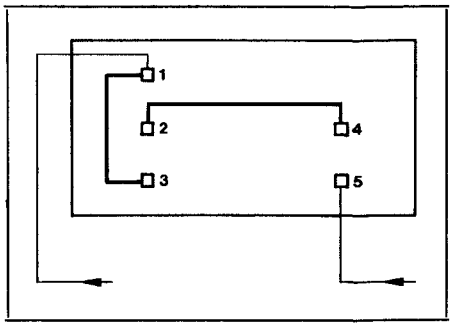
Mise à la terre : La mise à la terre peut être effectuée selon deux façons ;
1. par une prise de protection terre sur le panneau arrière.
2. par le cable secteur à trois conducteurs enfichés dans une prise comportant une terre.

Remarque : il est recommandé de ne se servir que d'une de ces alternatives afin d'éviter les bruits de fond.

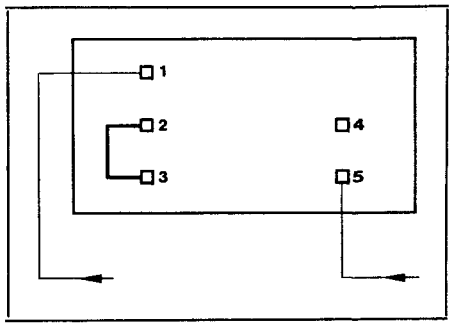
Fusible : un fusible thermique au transformateur secteur et un fusible de 1.6 A à action rapide protègent l'alimentation secteur.

Options : se référer aux instructions de l'installation pour chaque modèle.

115 V



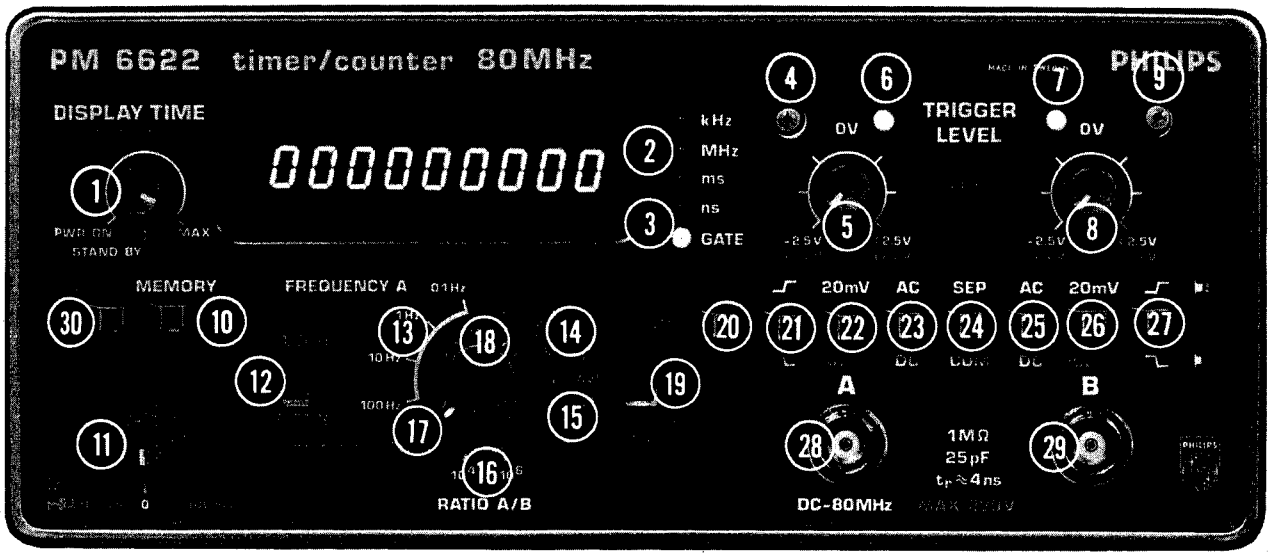
230 V



Controls, indicators and connectors PM 6622

Bedienungsorgane, Indikatoren und Anschlüsse von PM 6622

Organes de commande, connecteurs et indicateurs PM 6622



1. Display time control: Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.
Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns: Unit annunciators.

3. Gate lamp: Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A: Output socket for set trigger level.

5. Trigger control channel A: Sets trigger level from —2.5 V to +2.5 V when the attenuator is in position 20 mV, and from —25 V to +25 V when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A: Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B: Same as trigger lamp channel A.

1. Anzeigezeit (Display time): Potentiometer-Einstellung der Anzeigezeit zwischen 0,2 und 5 s. Unbegrenzte Anzeigezeit bei gezogenem Knopf. In Stellung STAND BY wird der Zähler mit Ausnahme des geheizten Oszillators abgeschaltet.
Warnung: Primärspannung des Netzteils ist eingeschaltet.

2. kHz, MHz, ms und ns: Anzeige der eingestellten Meßeinheit.

3. Lampe GATE: Zeigt, an, daß das Haupttor offen ist und eingezählt wird. In der Stellung STAND BY zeigt diese Lampe an, daß Netz oder Batterie angeschlossen sind, um den Kristalloszillator zu stabilisieren.

4. Monitorbuchse Kanal A: Ausgang für eingestellten Triggerpegel.

5. Einstellung des Triggerpegels Kanal A: Einstellung des Triggerpegels von —2,5 V bis +2,5 V (Abschwächer in Stellung 20 mV) oder von —25 V bis +25 V (Abschwächer in Stellung 200 mV). Durch Ziehen des Knopfes wird der Triggerpegel auf 0 V gestellt.

6. Triggerlampe Kanal A: Tristabile Anzeigelampe für den eingestellten Triggerpegel. Blinklicht zeigt an, daß der Triggerpegel auf Höhe des Eingangssignals liegt und eine Triggerung stattfindet. Leuchtet die Lampe dauernd, so ist der eingestellte Triggerpegel zu hoch, erlöscht sie ganz, ist er zu niedrig.

7. Triggerlampe Kanal B: Gleiche Funktion wie Triggerlampe Kanal A.

1. Commande du temps d'affichage : Ce potentiomètre règle le temps d'affichage entre 0.2 et 5 s. Le temps d'affichage infini est obtenu en tirant sur la commande. Avec le commutateur en position d'attente (STAND BY) le compteur est mis hors service, à l'exception de l'oscillateur à enceinte thermostatée.
Attention : La tension primaire de l'alimentation est en circuit !
2. KHz, MHz, ms et ns : Indicateurs d'unité.
3. Lampe de porte : Indique que la porte principale est ouverte et que le comptage a lieu. En position d'attente, la lampe de porte indique que la tension secteur ou batterie est appliquée en vue de la stabilisation de l'oscillateur cristal.

4. Douille de contrôle de la voie A : Douille de sortie pour le réglage du niveau de déclenchement.

5. Commande de déclenchement pour voie A : Règle le niveau de déclenchement de —2.5 V à + 2.5 V avec l'atténuateur en position 20 mV, et de —25 V à + 25 V avec l'atténuateur en position 200 mV. Le niveau de déclenchement est réglé sur 0 V en tirant sur la commande.

6. Lampe de déclenchement pour voie A : Lampe de contrôle (tri-state) du niveau de déclenchement réglé. Lorsque la lampe clignote, le niveau de déclenchement réglé correspond au niveau du signal d'entrée. Lorsque la lampe s'allume en permanence, le niveau est trop bas.

8. Trigger control channel B: Same as trigger control channel A.

9. Monitor socket channel B: Same as monitor socket channel A.

10. Memory: In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Hold off control: In Single Period Time Interval this control disables retriggering of the main gate until the set hold off time is out.

12. Start/stop by B-Gated by B: In the upper position it sets counter to measure Count A Start-Stop by B, in the lower position counter will measure Count A Gated by B.

13. Frequency A: Sets counter to measure frequency at input A. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single: Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μs.

15. Average: Sets counter to measure Multiple Period B or Time Interval Average A to B. 10^2, 10^4 and 10^6 are number of averagings.

16. Ratio A/B: Sets counter to measure ratio between signals at input A and B. 10^4 and 10^6 are multipliers.

17. Count A: Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector: Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B: Sets counter to measure Period B or Time interval A to B.

20. Self check: Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A: Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A: Provides 10× attenuation of the input signal.

23. AC/DC selector channel A: Selects AC or DC coupling of the input signal.

8. Einstellung des Triggerpegels Kanal B: Gleiche Funktion wie für Kanal A.

9. Monitorbuchse Kanal B: Gleiche Funktion wie Monitorbuchse Kanal A.

10. MEMORY (Speicher): In ausgelöster Stellung wird die Meßinformation bis Ende des nächsten Meßzyklus gespeichert. Bei eingedrückter Taste folgt die Anzeige kontinuierlich den Dekadenzählern.

11. HOLD OFF (Triggersperre): Bei Messung von Einzelperiode und Einzel-Zeitintervall verhindert HOLD OFF die Triggerung des Haupttors vor Ablauf der eingestellten Haltezeit.

12. Start/Stopp und Torsteuerung durch B: In der oberen Schalterstellung ist das Gerät auf Zählung A, Start/Stopp durch B eingestellt, in der unteren auf Zählung A und Torsteuerung durch B.

13. Frequenz A: Einstellung des Zählers auf Frequenzmessungen an Eingang A; 100 Hz, 10 Hz, 1 Hz und 0,1 Hz bezeichnen die Auflösung der niedrigsten Stelle.

14. SINGLE: Einstellung auf Messung von Einzelperiode B oder Einzel-Zeitintervall A-B. Zeitauflösung einstellbar auf 0,1 ms oder 0,1 μs.

15. AVG (Mittelwert): Einstellung auf Messung der Vielfachperiode B oder des Zeitintervall-Mittelwerts A-B. Anzahl der Meßperioden einstellbar auf 10^2, 10^4 und 10^6.

16. RATIO A/B: Zählereinstellung auf Verhältnismessung zwischen Signalen am Eingang A und Eingang B. Wählbare Multiplikatoren 10^4 und 10^6.

17. COUNT A: Einstellung des Zählers zum Summieren von Impulsen bei Start/Stopp oder Torsteuerung durch B.

18. Funktionswähler: Zusammen mit den beiden Schiebeschaltern werden hier die verschiedenen Meßarten gewählt.

19. PERIOD B/TIME INTERVAL A TO B: Einstellung des Zählers auf Messung von Periode B oder Zeitintervall A-B.

20. CHECK (Eigenkontrolle): Verbindet 10-MHz-Signale vom internen Oszillator mit den Eingangskreisen des Zählers.

21. Flankenwählschalter Kanal A: Einstellung der Triggerung auf negative oder positive Flanke des Eingangsignals.

22. Abschwächung Kanal A: 10-fache Abschwächung des Eingangssignals.

7. Lampe de déclenchement pour voie B : Identique à la lampe de déclenchement pour voie A.

8. Commande de déclenchement pour voie B : Identique à la commande de déclenchement pour voie A.

9. Douille de contrôle pour voie B : Identique à la douille de contrôle de la voie A.

10. Mémoire : En position relâchée, l'information de mesure est stockée jusqu'à ce que le cycle de mesure suivant soit accompli. En position enfoncée, l'affichage suit continuellement les compteurs à décade.

11. Retard de déclenchement (HOLD OFF) : En mode période simple et intervalle de temps simple, cette commande empêche un déclenchement intempestif de la porte principale jusqu'à ce que le temps du retard de déclenchement soit écoulé.

12. Démarrage/arrêt par B/ Déclenchement par B : En position supérieure, le compteur mesure le comptage A — démarrage/arrêt par B. En position inférieure, le compteur mesure le comptage A — déclenchement par B.

13. Fréquence A : Positionne le compteur pour mesure de fréquence à l'entrée A. 100 Hz, 10 Hz, 1 Hz et 0.1 Hz correspondent à la résolution du chiffre le moins significatif.

14. Simple ("SINGLE") : Positionne le compteur pour mesure de période simple B ou intervalle de temps simple A à B. La résolution de temps peut être réglée sur 0.1 ms ou 0.1 μs.

15. Moyenne ("AVG.") : Positionne le compteur pour mesure du période-multiple B ou intervalle de temps moyen de A à B. Les moyennes 10^2, 10^4 et 10^6, sont possibles.

16. Rapport A/B ("RATIO A/B") : Positionne le compteur pour mesure du rapport entre les signaux d'entrée A et B. Les multiplicateurs 10^4 et 10^6 sont possibles.

17. Comptage A : Positionne le compteur pour accumuler les impulsions entre les mesures démarrage-arrêt ou déclenchement par B.

18. Sélecteur de fonctions : Combiné avec les deux commutateurs linéaires, il permet la sélection des différents modes de mesure.

19. Période B/ Intervalle de temps A à B ("PERIOD B/TIME INT. A TO B") : Positionne le compteur pour mesure de période B, ou intervalle de temps A à B.

20. Auto Contrôle : Connecte le 10 MHz de l'oscillateur interne aux circuits d'entrée du compteur.

24. Separate/Common via B: Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B: Same as AC/DC selector channel A.

26. Attenuator channel B: Same as attenuator channel A.

27. Slope selector channel B: Same as slope selector channel A.

28. Input A: Input socket for frequency, ratio and time interval measurement.

29. Input B: Input socket for period, ratio and time interval measurement.

30. Reset: Resets counter and display to zero.

23. AC/DC-Wählschalter Kanal A: Wahl von AC- oder DC-Kopplung des Eingangssignals.

24. SEP/COM über B: In Stellung COM VIA B werden Kanal A und Kanal B intern verbunden. In Stellung SEP sind die beiden Eingangskanäle getrennt.

25. AC/DC-Wählschalter Kanal B: Siehe AC/DC-Wählschalter Kanal A.

26. Abschwächung Kanal B: Siehe Abschwächung Kanal A.

27. Flankenwählschalter Kanal B: Siehe Flankenwählschalter Kanal A.

28. Eingang A: Eingangsbuchse für Frequenz-, Verhältnis- und Zeitintervallmessungen.

29. Eingang B: Eingangsbuchse für Perioden-, Verhältnis- und Zeitintervallmessungen.

30. RESET: Rückstellung von Zähler und Anzeige auf Null.

21. Sélecteur de pente pour voie A : Positionne le compteur pour déclencher sur pente positive ou négative du signal d'entrée.

22. Atténuateur pour voie A : Fournit une atténuation 10 × du signal d'entrée.

23. Sélecteur AC/DC pour voie A : Sélectionne le couplage capacitif ou continu du signal d'entrée.

24. Séparé/Commun par B ("SEP/COM") : Connecte les voies A et B à l'intérieur en position COM VIA B. En position SEP, les voies d'entrée sont séparées.

25. Sélecteur AC/DC pour voie B : Identique au sélecteur AC/DC pour voie A.

26. Atténuateur voie B : Identique à l'atténuateur voie A.

27. Sélecteur de pente pour voie B : Identique au sélecteur de pente pour voie A.

28. Entrée A : Douille d'entrée pour mesure de fréquence, de rapport et d'intervalle de temps.

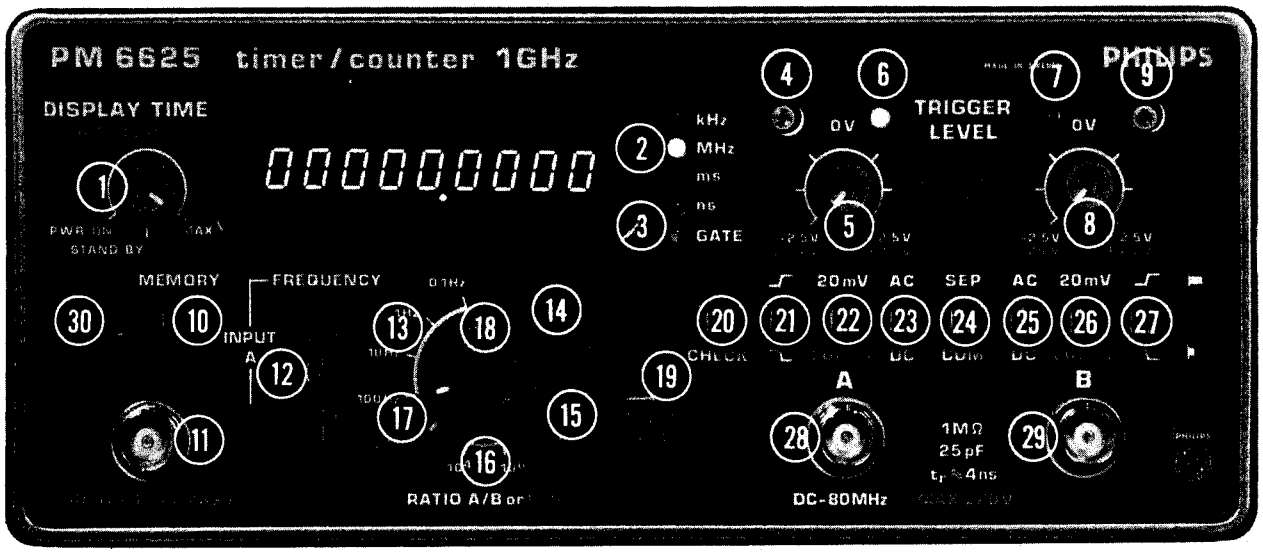
29. Entrée B : Douille d'entrée pour mesure de période, de rapport et d'intervalle de temps.

30. Remise à zéro : Remet le compteur et l'affichage à zéro.

Controls, indicators and connectors PM 6624 and PM 6625

Bedienungsorgane, Indikatoren und Anschlüsse von PM 6624 und PM 6625

Organes de commande, connecteurs et indicateurs PM 6624 et PM 6625



1. Display time control: Potentiometer sets display time between 0.2 and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.
Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns: Unit annunciators.

3. Gate lamp: Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A: Output socket for set trigger level.

5. Trigger control channel A: Sets trigger level from —2.5 V to +2.5 V when the attenuator is in position 20 mV, and from —25 V to +25 V when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A: Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B: Same as trigger lamp channel A.

1. Anzeigezeit (Display time): Potentiometer-Einstellung der Anzeigezeit zwischen 0,2 und 5 s. Unbegrenzte Anzeigezeit bei gezogenem Knopf. In Stellung STAND BY wird der Zähler mit Ausnahme des geheizten Oszillators abgeschaltet.
Warnung: Primärspannung des Netzteils ist eingeschaltet.

2. kHz, MHz, ms und ns: Anzeige der eingestellten Meßeinheit.

3. Lampe GATE: Zeigt an, daß das Haupttor offen ist und eingezählt wird. In der Stellung STAND BY zeigt diese Lampe an, daß Netz oder Batterie angeschlossen sind, um den Kristalloszillator zu stabilisieren.

4. Monitorbuchse Kanal A: Ausgang für eingestellten Triggerpegel.

5. Einstellung des Triggerpegels Kanal A: Einstellung des Triggerpegels von —2,5 V bis +2,5 V (Abschwächer in Stellung 20 mV) oder von —25 V bis +25 V (Abschwächer in Stellung 200 mV). Durch Ziehen des Knopfes wird der Triggerpegel auf 0 V gestellt.

6. Triggerlampe Kanal A: Tristabile Anzeigelampe für den eingestellten Triggerpegel. Blinklicht zeigt an, daß der Triggerpegel auf Höhe des Eingangssignals liegt und eine Triggerung stattfindet. Leuchtet die Lampe dauernd, so ist der eingestellte Triggerpegel zu hoch, erlöscht sie ganz, ist er zu niedrig.

1. Commande du temps d'affichage : Ce potentiomètre règle le temps d'affichage entre 0.2 s et 5 s. On obtient le temps d'affichage infini en tirant sur la commande. En position d'attente (STAND BY) le compteur est mis hors service à — l'exception de l'oscillateur à enceinte thermostatée.
Attention : La tension primare de l'alimentation est en circuit !

2. KHz, MHz, ms et ns : Indicateurs d'unité.

3. Lampe de porte : Indique que la porte principale est ouverte et que le comptage a lieu ; en position d'attente, la lampe de porte indique que la tension secteur ou batterie est appliquée en vue de la stabilisation de l'oscillateur cristal.

4. Douille de contrôle de la voie A : Douille de sortie pour le réglage du niveau de déclenchement.

5. Commande de déclenchement pour voie A : Règle le niveau de déclenchement de —2.5 V à + 2.5 V avec atténuateur en position 20 mV et de —25 V + 25 V avec atténuateur en position 200 mV. Le niveau de déclenchement est réglé sur 0 V en tirant sur ce bouton.

6. Lampe de déclenchement pour voie A : Lampe de contrôle (tri-state) du niveau de déclenchement réglé. Lorsque la lampe clignote, le niveau de déclenchement réglé correspond au niveau du signal d'entrée. Lorsque la lampe est allumée en permanence, le niveau de déclenchement est trop

8. Trigger control channel B: Same as trigger control channel A.

9. Monitor socket channel B: Same as monitor socket channel A.

10. Memory: In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Input C: Input socket for frequency and ratio measurement.

12. Start-Stop by B/Gated by B and Input A/Input C: In the upper position it sets counter to measure Count A Start-Stop by B, Frequency A, or Ratio A/B and in the lower position it sets counter to measure Count A Gated by B, Frequency C or Ratio C/B depending on how the Function Selector is set.

13. Frequency A and C: Sets counter to measure frequency at inputs A and C. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single: Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μs.

15. Average: Sets counter to measure Multiple Period B or Time Interval average A to B. 10^2, 10^4 and 10^6 are number of averagings.

16. Ratio A/B or C/B: Combined with Input A/Input C switch it selects Ratio A/B or Ratio C/B measurement. 10^4 and 10^6 are multipliers.

17. Count A: Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector: Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B: Sets counter to measure Period B or Time interval A to B.

20. Self check: Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A: Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A: Provides 10× attenuation of the input signal.

7. Triggerlampe Kanal B: Gleiche Funktion wie Triggerlampe Kanal A.

8. Einstellung des Triggerpegels Kanal B: Gleiche Funktion wie für Kanal A.

9. Monitorbuchse Kanal B: Gleiche Funktion wie Monitorbuchse Kanal A.

10. MEMORY (Speicher): Bei gelöster Taste wird die Meßinformation bis Ende des nächsten Meßzyklus gespeichert. Bei eingedrückter Taste folgt die Anzeige kontinuierlich den Dekadenzählern.

11. Eingang C: Eingangsbuchse für Frequenz- und Verhältnismessung.

12. Stort/Stopp und Torsteuerung durch B sowie INPUT A/INPUT C: In der oberen Schalterstellung ist das Gerät auf Zählung A (Start/Stopp durch B), Frequenz A oder Verhältnis A/B eingestellt. In der unteren Schalterstellung hingegen auf Zählung A (Torsteuerung durch B), Frequenz C oder Verhältnis C/B — je nach Einstellung des Funktionswählers.

13. Frequenz A und C: Einstellung auf Frequenzmessungen an den Eingängen A und C; 100 Hz, 10 Hz, 1 Hz und 0,1 Hz bezeichnen die Auflösung der niedrigsten Stelle.

14. SINGLE: Einstellung auf Messung der Einzelperiode B oder des Einzel-Zeitintervalls A-B. Zeitauflösung einstellbar auf 0,1 ms oder 0,1 μs.

15. AVG (Mittelwert): Einstellung auf Messung der Vielfachperiode B oder des Zeitintervall-Mittelwerts A-B. Anzahl der Meßperioden einstellbar auf 10^2, 10^4 und 10^6.

16. RATIO A/B or C/B: Zusammen mit dem Schalter INPUT A/INPUT C wird hier zwischen Verhältnismessung A/B oder C/B gewählt. 10^4 und 10^6 sind wählbare Multiplikatoren.

17. COUNT A: Einstellung des Zählers zum Summieren von Impulsen bei Start/Stopp oder Torsteuerung durch B.

18. Funktionswähler: Zusammen mit den beiden Schiebeschaltern werden hier die verschiedenen Meßarten gewählt.

19. PERIOD B/TIME INTERVAL A TO B: Einstellung des Zählers auf Messung von Periode B oder Zeitintervall A-B.

20. CHECK (Eigenkontrolle): Verbindet 10-MHz-Signale vom internen Oszillator mit den Eingangskreisen des Zählers.

élevé, par contre, si la lampe s'éteint ce niveau est trop bas.

7. Lampe de déclenchement pour voie B : Identique à la lampe de déclenchement pour voie A.

8. Commande de déclenchement pour voie B : Identique à la commande de déclenchement pour voie A.

9. Douille de contrôle de la voie B : Identique à la douille de contrôle de la voie A.

10. Mémoire : En position relâchée, l'information de mesure est stockée jusqu'à ce que le cycle de mesure suivant soit accompli. En position enfoncée, l'affichage suit continuellement les compteurs à decade.

11. Entrée C : Douille d'entrée pour mesure de fréquence et de rapport.

12. Démarrage/Arrêt par B/Déclenchement par B et Entrée A/Entrée C : En position supérieure, le compteur mesure le comptage A — démarrage/ arrêt par B, la fréquence ou le rapport A/B. En position inférieure, le compteur mesure le comptage A — déclenchement par B, la fréquence C ou le rapport C/B selon la position du sélecteur de fonctions.

13. Fréquence A et C : Positionne le compteur pour mesurer la fréquence aux entrées A et C. 100 Hz, 10 Hz, 1 Hz et 0.1 Hz correspondent à la résolution du chiffre le moins significatif.

14. Simple (SINGLE) : Positionne le compteur pour mesurer la période simple B, ou l'intervalle de temps simple de A à B. La résolution de temps peut être réglée sur 0.1 ms ou 0.1 μs.

15. Moyenne (AVG.) : Positionne le compteur pour mesurer la période multiple B, ou la moyenne de l'intervalle de temps A à B, 10^2, 10^4 et 10^6, sont le nombre de moyennes possibles.

16. Rapport A/B ou C/B : Combinée avec entrée A/entrée C, cette position permet de mesurer le — rapport A/B ou le rapport C/B. Les multiplicateurs 10^4 et 10^6 sont possibles.

17. Comptage A : Positionne le compteur pour accumuler les impulsions entre les mesures démarrage — arrêt ou déclenchement par B.

18. Sélecteur de fonctions : Combiné avec les deux commutateurs à coulisse, il sélectionne les différents modes de mesure.

19. Période B/Intervalle de temps A à B ("PERIOD B/ TIME INT. A TO B") : Positionne le compteur pour mesurer la période B ou l'intervalle de temps — A à B.

23. AC/DC selector channel A: Selects AC or DC coupling of the input signal.

24. Separate/Common via B: Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B: Same as AC/DC selector channel A.

26. Attenuator channel B: Same as attenuator channel A.

27. Slope selector channel B: Same as slope selector channel A.

28. Input A: Input socket for frequency, ratio and time interval measurement.

29. Input B: Input socket for period, ratio and time interval measurement.

30. Reset: Resets counter and display to zero.

21. Flankenwählschalter Kanal A: Einstellung der Triggerung auf negative oder positive Flanke des Eingangsignals.

22. Abschwächung Kanal A: 10-fache Abschwächung des Eingangssignals.

23. AC/DC-Wählschalter Kanal A: Wahl von AC- oder DC-Kopplung des Eingangsignals.

24. SEP/COM über B: In Stellung COM VIA B werden Kanal A und Kanal B intern verbunden. In Stellung SEP sind die beiden Eingangskanäle getrennt.

25. AC/DC-Wählschalter Kanal B: Siehe AC/DC-Wählschalter Kanal A.

26. Abschwächung Kanal B: Siehe Abschwächung Kanal A.

27. Flankenwählschalter Kanal B: Siehe Flankenwählschalter Kanal A.

28. Eingang A: Eingangsbuchse für Frequenz-, Verhältnis- und Zeitintervallmessungen.

29. Eingang B: Eingangsbuchse für Perioden-, Verhältnis- und Zeitintervallmessungen.

30. RESET: Rückstellung von Zähler und Anzeige auf Null.

20. Auto Contrôle : Connecte le 10 MHz de l'oscillateur interne aux circuits d'entrée du compteur.

21. Sélecteur de pente pour voie A : Positionne le compteur pour déclencher sur la pente positive ou négative du signal d'entrée.

22. Atténuateur voie A : Fournit une atténuation 10 × du signal d'entrée.

23. Sélecteur AC/DC pour voie A : Sélectionne le couplage capacitif ou continu du signal d'entrée.

24. Séparé/Commun par B ("SEP/COM") : Connecte les voies A et B à l'intérieur en position COM VIA B. En position SEP, les voies d'entrée sont séparées.

25. Sélecteur AC/DC pour voie B : Identique au sélecteur AC/DC pour voie A.

26. Atténuateur pour voie B : Identique à l'atténuateur pour voie A.

27. Sélecteur de pente pour voie B : Identique au sélecteur de pente pour voie A.

28. Entrée A : Douille d'entrée pour mesure de fréquence, de rapport et d'intervalle de temps.

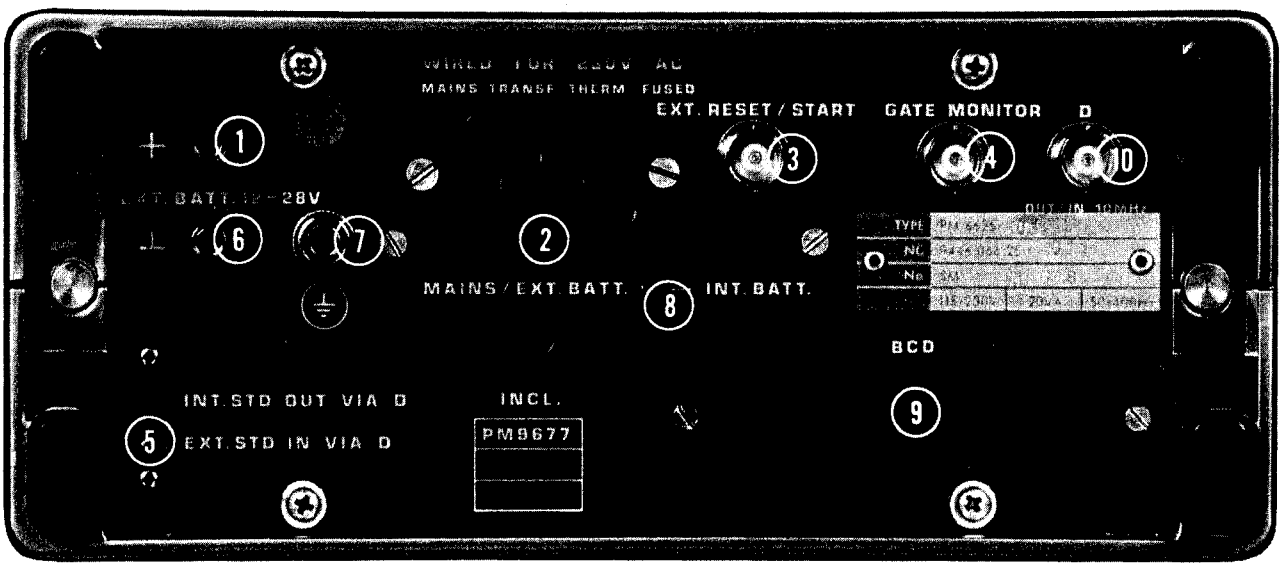
29. Entrée B : Douille d'entrée pour mesure de période, de rapport et d'intervalle de temps.

30. Remise à zéro : Remet le compteur et l'affichage à zéro.

Controls and connectors

Bedienungsorgane und Anschüsse

Organes de commande et connecteurs



1. External battery socket: Plus pole input socket för external battery.

2. Mains input: Input socket for the mains.

3. External reset input: Input socket for reset/start signal.

4. Monitor socket gate signal: Output socket for gate and hold off (PM 6622) signals.

5. Internal/External Standard switch: Sets operating mode of input D to either internal 10 MHz out or external 10 MHz in.

6. External battery socket: Minus pole input socket for external battery.

7. Chassis ground: Protective earth terminal.

8. Mains/Battery switch: Sets power supply to be fed from external or internal power source.

9. BCD and D/A connector: Output connector for the BCD and D/A units.

10. Internal/External Standard socket: 10 MHz out or external 10 MHz in.

1. Buchse für externe Batterie: Pluspol zum Anschluß der externen Batterie.

2. Netzeingang: Anschluß des Netzkabels.

3. Buchse für externe Rückstellung: Eingang für externe Rückstell-/Startsignale.

4. Monitorbuchse für Torsignale: Ausgang für Tor- und HOLD OFF-Signale (letztere nur PM 6622).

5. Schalter INT. STD./EXT. STD.: Einstellung der Betriebsart von Eingang D auf interne 10 MHz oder externe 10 MHz.

6. Buchse für externe Batterie: Minuspol zum Anschluß der externen Batterie.

7. Gehäuseerdung: Schutzerdungsklemme.

8. Umschalter Netz/Batterie: Einstellung auf Netz- oder Batteriespeisung des Geräts.

9. Buchse für BCD und D/A: Ausgang für BCD-Steckkarte oder D/A-Wandler.

10. Buchse für internen/externen Standard: 10-MHz-Ausgang oder externer 10-MHz-Eingang.

1. Douille pour batterie externe : Douille d'entrée à pôle positif pour batterie externe.

2. Entrée secteur : Douille d'entrée secteur.

3. Entrée de remise à zéro externe : Douille d'entrée pour remise à zéro/ signal de démarrage.

4. **Douille de contrôle pour signal de porte :** Douille de sortie pour — signaux de porte et de retard de déclenchement (PM 6622).

5. Commutateur standard interne/externe: Commute soit l'oscillateur interne, soit l'oscillateur externe, avec entrée ou sortie de la fréquence 10 MHz, sur la douille D.

6. Douille pour batterie externe : Douille d'entrée à pôle négatif, pour batterie externe.

7. Prise de terre : Protection terre.

8. Commutateur secteur/batterie : Règle l'alimentation pour source interne ou externe.

9. Connecteur BCD et D/A : Connecteur de sortie pour unités BCD et D/A.

10. Douille standard interne/externe : Sortie du signal 10 MHz, ou entrée du signal 10 MHz externe.

Operation

Mains: Before the counter is connected to the mains check that the mains transformer is wired for the local mains voltage as described in chapter Installation.
— Set switch MAINS EXT. BATT/INT. BATT on the rear panel to position MAINS EXT. BATT.
— Connect the mains cable to input socket for the mains at the rear panel.
— Set DISPLAY TIME control at the front panel to position ON.
— Check that display turns on indicating that power is on.

External battery: Set switch MAINS EXT. BATT/INT. BATT at the rear panel to position MAINS EXT. BATT.
— Connect the cables from the external battery to sockets EXT. BATT. 12—28 V at the rear panel.
— Set DISPLAY TIME at the front panel control to position ON.
— Check that display turns on indicating that power is on.

Internal battery PM 9673: Set switch MAINS EXT. BATT/INT. BATT. at the rear panel to position INT. BATT.
— Set DISPLAY TIME control at the front panel to position ON.
— Check that display turns on indicating that power is on. Blinking display indicates low voltages. Refer to manual PM 9673 for charging instructions.

Warm up time: The warm up time from the moment of mains connection is less than 7 minutes to an oscillator error of less than 10^{-7} for instruments equipped with the oven enclosed oscillator PM 9690. Instruments equipped with the oscillators PM 9677 or PM 9678 (TCXO) are ready for use at the moment of mains connection.
Normally the instrument is switched on from the STAND BY position. If so, no warm up time it needed, irrespective of which oscillator is employed.

External frequency standards: House standards or other frequency standards can be used instead of the internal 10 MHz oscillator.
If a time resolution of 100 ns is required, 10 MHz must be used. When using 1 MHz instead of 10 MHz the decimal point must be shifted one step to the left to interpret the display correctly. To set the counter to external standard the switch INT. STD OUT VIA D/EXT. STD IN VIA D at the rear panel must be set to position EXT. STD IN VIA D.

Betrieb

Netzanschluß: Vor Anschluß des Zählers an das Netz überzeuge man sich, daß der Netztrafo der örtlichen Spannung entsprechend verdrahtet ist (vgl. Abschnitt „Installation").
— Schalter MAINS EXT. BATT/INT. BATT auf der Rückseite des Geräts auf MAINS EXT. BATT stellen.
— Netzkabel auf der Rückseite einstecken.
— Einsteller DISPLAY TIME auf ON stellen.
— Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist.

Externe Batterie: Schalter MAINS EXT. BATT/INT. BATT auf der Rückseite des Geräts auf MAINS EXT. BATT stellen.
— Anschlußkabel der externen Batterie in die Buchsen EXT. BATT 12—28 V auf der Rückseite stecken.
— Einsteller DISPLAY TIME auf ON stellen.
— Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist.

Interne Batterie PM 9673: Schalter MAINS EXT. BATT/INT. BATT auf der Geräterückseite auf INT. BATT stellen.
— Einsteller DISPLAY TIME auf ON stellen.
— Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist. Blinkende Anzeige bedeutet zu niedrige Spannung. Anweisungen zur Aufladung der Batterie enthält das Handbuch PM 9673.

Aufwärmzeit: Die Aufwärmzeit vom Netzanschluß bis zur Erreichung einer Oszillator-Fehlergrenze von unter 10^{-7} beträgt bei Geräten mit dem geheizten Oszillator PM 9690 weniger als 7 Minuten. Zähler mit den Oszillatoren PM 9677 oder PM 9678 (TCXO) sind sofort nach Netzanschluß betriebsbereit.
Gewöhnlich wird das Instrument aus der Stellung STAND BY eingeschaltet. In diesem Fall ist keine Aufwärmzeit erforderlich, gleichgültig welcher Oszillator verwendet wird.

Externe Frequenzstandards: Anstelle des 10-MHz-Oszillators können auch andere Frequenzstandards verwendet werden.
Um eine Zeitauflösung von 100 ns zu erreichen, sind jedoch 10 MHz unbedingt erforderlich. Bei Verwendung von

Mise en service

Secteur : Avant de brancher le compteur au secteur, vérifier si le — transformateur secteur est connecté pour la tension secteur locale, comme décrit au chapitre INSTALLATION.
— Mettre le commutateur MAINS EXT. BATT/INT. BATT du panneau arrière, en position MAINS EXT. BATT.
— Connectez le câble secteur à la douille d'entrée secteur à l'arrière.
— Réglez la commande DISPLAY TIME (panneau avant) sur position ON.
— Vérifier si l'affichage s'allume, indiquant ainsi que l'appareil est branché.

Batterie externe : Mettre le commutateur MAINS EXT. BATT/INT. BATT (panneau arrière) en position MAINS EXT. BATT.
— Connecter les câbles de la batterie externe aux douilles EXT. BATT. 12—28 V (panneau arrière).
— Mettre la commande DISPLAY TIME (panneau avant) en position ON.
— Vérifier si l'affichage s'allume, indiquant ainsi que l'appareil est branché.

Batterie interne PM 9673 : Mettre le commutateur MAINS EXT. BATT/INT. BATT (panneau arrière) en position INT. BATT.
— Mettre la commande DISPLAY TIME (panneau avant) en position ON.
— Vérifier que l'affichage s'allume, indiquant ainsi que l'appareil est branché. Si l'affichage clignote, cela signifie que les batteries sont presque déchargées. Voir la notice PM 9673 pour instructions de charge.

Temps de chauffage : Le temps de chauffage à partir du branchement au secteur est inférieur à 7 minutes avec erreur de l'oscillateur inférieure à 10^{-7}, lorsque les compteurs sont équipés de l'oscillateur à enceinte thermostatée PM 9690. Les appareils équipés des oscillateurs PM 9677 ou PM 9678 (TCXO) sont prêts à l'usage dès le branchement au secteur.
Normalement, l'appareil est enclenché en position d'attente (STAND BY). Dans ce cas, le temps de chauffage n'est pas nécessaire, quelque soit l'oscillateur utilisé.

Etalons de fréquence externe : Des étalons de fréquence externe peuvent être utilisés à la place de l'oscillateur interne 10 MHz.
Pour une résolution de temps de 100 ns, l'oscillateur à 10 MHz doit être utilisé. En cas d'application de 1 MHz au lieu de 10 MHz, le point décimal doit

A, B and C inputs: The A and B amplifiers are identical in specification and provided with identical input controls. The A input is normally used for frequency measurement and the B input for time measurement.
The C input is a prescaler input with automatic PIN-diode attenuator and mainly used for high frequency meaurement.

ac and dc coupling: The ac/dc push-button controls the coupling of the input signal to the attenuator and the amplifier by switching a capacitor in series in the ac mode and by direct coupling in the dc mode.
ac coupling is normally used to block the dc component in signals which are superimposed on a ac voltage. The capacitor in series will, however, cause a falling sensitivity for low frequencies. In waveforms where pulse width and repetition time vary the dc level will also vary. Change in the dc level will cause changes in the preset triggering level and make accurate time measurements impossible if ac coupled, in such cases the input should be dc coupled. Normally frequency measurements are performed with an ac coupled input and time interval measurements with a dc coupled input.

Attenuator and Trigger Level: The TRIGGER LEVEL control allows continuous setting of the trigger level at any point of the input signal. For high amplitude signals the attenuator is used to expand the setting range.
However, input attenuation will decrease the sensitivity and cause bigger trigger errors.
For frequency measurements on sine wave and other symmetrical signals no level off-set is required. Pulled position of the TRIGGER LEVEL control sets the trigger level to 0 V for highest sensitivity.
However, for frequency measurement on narrow pulses a limited off-set voltage may be needed to obtain reliable triggering.
Time measurement requires continuously variable setting of the trigger level.
Monitor sockets for channel A and B provide the ability to measure the set trigger level.
If the attenuator is set to 200 mV the trigger level range is increased 10 times from ±2.5 V to ±25 V.
The name trigger level can be misleading, since triggering does not occur on the set trigger level but at the trigger point.

1 MHz anstelle von 10 MHz ist der Dezimalpunkt um eine Stelle nach links zu verschieben, um die Anzeige korrekt abzulesen. Um den Zähler auf ein externes Standardsignal einzustellen, ist der Schalter INT. STD. OUT VIA D/ EXT. STD. IN VIA D in die Stellung EXT. STD. IN VIA D zu bringen.

Eingänge A, B und C: Die Verstärker A und B sind den Kenngrössen und Eingangsreglern nach identisch. Der Eingang A wird gewöhnlich für Frequenzmessungen verwendet, der Eingang B für Zeitmessungen.
Der Eingang C ist ein Vorteilereingang mit automatischem PIN-Dioden-Abschwächer und wird vorzugsweise zum Messen hoher Frequenzen verwendet.

AC- und DC-Kopplung: Die Drucktaste AC/DC regelt die Kopplung des Eingangsignals mit dem Abschwächer und dem Verstärker durch Serienschaltung eines Kondensators im AC-Betrieb bzw. Direktkopplung im DC-Betrieb.
Die AC-Kopplung wird gewöhnlich verwendet, um die Gleichspannungskomponente von Signalen, die einer Wechselspannung überlagert sind, zu unterdrücken. Der seriengeschaltete Kondensator verursacht jedoch eine Abnahme der Empfindlichkeit bei niedrigen Frequenzen. Bei Signalformen mit wechselnder Impulsbreite und Wiederholzeit wechselt auch der Gleichspannungspegel. Veränderungen des Gleichspannungspegels führen wiederum zu Schwankungen des voreingestellten Triggerpegels und machen, falls AC-gekoppelt, genaue Zeitmessungen unmöglich. In solchen Fällen sollte der Eingang DC-gekoppelt sein. Normalerweise werden Frequenzmessung mit AC-gekoppeltem Eingang und Zeitintervallmessungen mit DC-gekoppeltem Eingang durchgeführt.

Abschwächer und Triggerpegel: Mit dem Potentiometer TRIGGER LEVEL läßt sich der Triggerpegel stufenlos auf jeden beliebigen Punkt des Eingangsignals einstellen. Bei hohen Amplituden wird ein Abschwächer verwendet, um den Einstellbereich zu erweitern.
Eingangsdämpfung vermindert jedoch die Empfindlichkeit und verursacht größere Triggerfehler.
Für Frequenzmessungen an sinusförmigen und anderen symmetrischen Signalen ist kein Pegel-Offset erforderlich. Durch Ziehen des Knopfes TRIGGER LEVEL wird der Triggerpegel auf

être décalé d'une unité vers la gauche, afin d'interpréter — correctement l'affichage. Pour régler le compteur sur étalon externe, régler le commutateur INT. STD OUT VIA D/EXT. STD IN VIA D en position — EXT. STD IN VIA D.

Entrées A, B et C : Les amplificateurs A et B sont identiques en spécification et pourvus des mêmes commandes d'entrée.
L'entrée A est normalement utilisée pour la mesure de fréquence, et l'entrée B pour la mesure de temps.
L'entrée C est une entrée de pré-étalonnage avec atténuateur automatique à diodes PIN et utilisée principalement pour la mesure de haute fréquence.

Couplages capacitif et continu : Les boutons-poussoires AC/DC contrôlent le couplage du signal d'entrée vers l'atténuateur et l'amplificateur en commutant un condensateur en série en mode AC (capacitif) et par couplage direct en mode DC (continu). Le couplage capacitif est normalement utilisé pour bloquer les — composantes continues dans les signaux superposés à une tension alternatif quoique le condensateur en série fasse décroître la sensibilité à basse fréquence.
Les formes d'onde à largeur d'impulsion et de temps de répétition variables présentent également un niveau continu variable.
Lorsque le niveau continu varie, le niveau de déclenchment préréglé varie également et rend les mesures de temps imprécises en couplage — capacitif. Dans de tels cas, l'entrée doit être couplée en continu. Normalement les mesures de fréquence sont effectuées avec une entrée en couplage capacitif, et les mesures d'intervalle de temps avec une entrée en couplage continu.

Atténuateur et niveau de déclenchement : La commande TRIGGER LEVEL permet le réglage continu du niveau de déclenchement en tout point du signal d'entrée. Pour les signaux à haute amplitude, l'atténuateur sert à étendre la gamme de réglage.
Cependant, l'atténuation d'entrée fait décroître la sensibilité et entraîne des erreurs de déclenchements plus importantes.
Pour des mesures de fréquence sur onde sinusoïdale et d'autres signaux symétriques, aucun offset de niveau n'est requis.
Le niveau de déclenchement est réglé

Separate and Common via B mode: In the SEP position the A and B inputs operate independently of each other in any operations irrespective of input sources. In the COM position the A input is disconnected from its attenuator and amplifier, and a signal connected to input B is coupled to both A and B attenuators and amplifiers.
All input specifications of input B will remain the same but the input impedance will be 500 kΩ shunted by 50 pF.

Positive and negative slope triggering: This push-button determines on which slope of the input signal the triggering will occur.
In released position the triggering will occur at the positive slope of the input signal and in depressed position it will occur on the negative slope.
Where on the slope the triggering will occur is determined by the TRIGGER LEVEL control.
A simple way to measure the pulse width of a positive pulse is achieved by setting input A to positive slope and input B to negative slope, connect the pulse to input B, set FUNCTION SELECTOR to any of the two SINGLE positions, slide switch PERIOD B/TIME INT. A TO B to position TIME INT. A TO B and SEP/COM to COM.

Hold off PM 6622: This control provides a delayed triggering of the instrument in single period and time interval measurement, this feature is used to avoid false triggering on noisy signals.

0 V für höchste Empfindlichkeit eingestellt.
Für Frequenzmessungen an schmalen Impulsen kann jedoch eine begrenzte Offset-Spannung erforderlich sein, um eine verläßliche Triggerung zu erreichen.
Für Zeitmessungen ist eine stufenlos variable Einstellung des Triggerpegels erforderlich.
Mit Hilfe der Monitorbuchsen für Kanal A und B läßt sich der eingestellte Triggerpegel messen.
Durch Einstellung des Abschwächers auf 200 mV wird der Triggerpegelbereich zehnfach erweitert, von ± 2,5 auf ± 25 V.
Die Bezeichnung Triggerpegel mag hier irreführend sein, da die Triggerung nicht am eingestellten Triggerpegel erfolgt, sondern am Triggerpunkt.

Schaltart SEP (getrennt) und COM (gemeinsam) über B: In Stellung SEP arbeiten die Eingänge A und B in jeder Betriebsart unabhängig voneinander, ungeachtet der Signalquellen. In Stellung COM ist der Eingang A von seinem Abschwächer und Verstärker getrennt, und das Signal am Eingang B wird an die Abschwächer und Verstärker beider Kanäle (A und B) gekoppelt. Alle Kenngrössen von Eingang B bleiben unverändert, doch beträgt die Eingangsimpedanz 500 kΩ, geshunted mit 50 pF.

Triggerung auf positiver und negativer Flanke: Mit dieser Drucktaste wird die gewünschte Triggerflanke gewählt. Bei gelöster Taste erfolgt die Triggerung auf der positiven Flanke des Eingangsignals, bei gedrückter Taste auf der negativen Flanke.
An welchem Punkt die Triggerung erfolgt, hängt von der Einstellung des Stellknopfes TRIGGER LEVEL ab.
Die Breite eines positiven Impulses läßt sich auf einfache Weise wie folgt messen: Eingang A auf positive Flanke und Eingang B auf negative Flanke einstellen, Impuls an Eingang B legen, Funktionswähler auf eine der beiden SINGLE-Funktionen, Schiebeschalter PERIOD B/TIME INT. A TO B auf TIME INT. A TO B sowie SEP/COM auf COM stellen.

Hold off (PM 6622): Dieser Einsteller ermöglicht eine verzögerte Triggerung des Geräts bei der Messung von Einzelperioden und Zeitintervallen. Dadurch werden Fehltriggerungen bei verrauschten Signalen vermieden.

sur O V pour une plus haute — sensibilité, en tirant sur la commande TRIGGER LEVEL.
Cependant, pour la mesure de fréquence en impulsions étroites une tension d'offset limitée peut être requise afin d'obtenir un déclenchement fiable.
La mesure de temps requiert un réglage continuellement variable du niveau de déclenchement.
Les douilles de contrôle pour les voies A et B permettent de mesurer le niveau de déclenchement exact.
Si l'atténuateur est réglé sur 200 mV, la gamme du niveau de déclenchement est accrue de 10 fois de ± 2.5 V à ± 25 V.
La dénomination "niveau de déclenchement" peut sembler abusive, car le déclenchement n'a pas lieu au niveau de déclenchement réglé, mais au point de déclenchement.

Modes d'entrée Séparée et Commune par B : En position SEP les entrées A et B fonctionnent indépendamment l'une de l'autre sans tenir compte des fonctions, ni des sources d'entrée.
En position COM, l'entrée A est déconnectée de son atténuateur et de son amplificateur, et un signal connecté à l'entrée "B" est couplé aux atténuateurs et amplificateurs A et B.
Toutes les spécifications d'entrée B restent identiques, si ce n'est que l'impédance d'entrée qui est de 500 k-ohm déviée à travers 50 pF.

Déclenchement sur pente positive et négative : Ce bouton-poussoir détermine sur quelle pente du signal d'entrée, aura lieu le déclenchement.
En position relâchée le déclenchement a lieu sur la pente positive du signal d'entrée, et en position enfoncée, le déclenchement a lieu sur la pente négative.
Le point de déclenchement est déterminé par la commande TRIGGER LEVEL.
La largeur d'une impulsion positive peut être mesurée en réglant l'entrée A sur pente positive et l'entrée B sur pente négative, connecter ensuite l'impulsion à l'entrée B, régler le sélecteur de fonctions sur une des deux positions SINGLE, coulisser le commutateur PERIOD B/TIME INT. A TO B en position TIME INT. A TO B et SEP/COM sur COM.

Retard de déclenchement sur PM 6622 : Cette commande permet le déclenchement retardé de l'appareil pour mesure de période simple et d'intervalle de temps, et ce afin d'éviter un faux déclenchement sur des signaux bruités.

Basic measurements

Self check PM 6622

— Depress CHECK push-button
— Rotate FUNCTION SELECTOR and read:

Frequency A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 kHz
0.1 Hz 10000.0000 kHz

— Set PERIOD B/TIME INT. A TO B to PERIOD B

Period B	Ratio A/B
0.1 ms 00000000.0 ms	10^6 001.000000
0.1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

Count A
Start/Stop 000000002
Gated 000000001

Self check PM 6624

— Depress CHECK push-button
— Set INPUT A/INPUT C to INPUT A
— Rotate FUNCTION SELECTOR and read:

Frequency A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 kHz
0.1 Hz 10000.0000 kHz

— Set PERIOD B/TIME INT. A TO B to PERIOD B

Period B	Ratio A/B
0.1 ms 00000000.0 ms	10^6 001.000000
0.1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

— Set INPUT A/INPUT C to INPUT C

Ratio C/B
10^4 00008.0000
10^6 008.000000

Count A
Start/Stop 000000002
Gated 000000001

Frequency C
100 Hz 00080.0000 MHz
10 Hz 0080.00000 MHz
1 Hz 080000.000 kHz
0.1 Hz 80000.0000 kHz

Grundlegende Messungen

Eigenkontrolle PM 6622

— Taste CHECK drücken
— Funktionswähler drehen und auf der Anzeige ablesen:

Frequenz A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 kHz
0,1 Hz 10000.0000 kHz

— Schalter PERIOD B/TIME INT. A TO B auf PERIOD B stellen und ablesen:

Periode B	Verhältnis A/B
0,1 ms 00000000.0 ms	10^6 001.000000
0,1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

Zählung A
Start/Stop 000000002
Torgesteuert 000000001

Eigenkontrolle PM 6624

— Taste CHECK drücken.
— Schalter INPUT A/INPUT C auf INPUT A stellen.
— Funktionswähler drehen und dabei auf der Anzeige ablesen:

Frequenz A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 kHz
0,1 Hz 10000.0000 kHz

— Schalter PERIOD B/TIME INT. A TO B auf PERIOD B stellen und ablesen:

Periode B	Verhältnis A/B
0,1 ms 00000000.0 ms	10^6 001.000000
0,1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

— Schalter INPUT A/INPUT C auf INPUT C stellen und ablesen:

Verhältnis C/B
10^4 00008.0000
10^6 008.000000

Zählung A
Start/Stop 000000002
Torgesteuert 000000001

Frequenz C
100 Hz 00080.0000 MHz
10 Hz 0080.00000 MHz
1 Hz 080000.000 kHz
0,1 Hz 80000.0000 kHz

Mesures de base

Auto Contrôle de PM 6622

— Enfoncer le bouton-poussoir CHECK
— Tourner le sélecteur de fonctions et lire :

Fréquence A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 KHz
0.1 Hz 10000.0000 KHz

— Mettre PERIOD B/TIME INT. A TO B sur PERIOD B

Période B	Rapport A/B
0.1 ms 00000000.0 ms	10^6 001.000000
0.1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

Comptage A
Démarrage/arrêt 000000002
Déclenché 000000001

Auto Contrôle du PM 6624

— Enfoncer le bouton-poussoir CHECK
— Mettre INPUT A/INPUT C sur INPUT A
— Tourner le sélecteur de fonctions et lire :

Fréquence A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 KHz
0.1 Hz 10000.0000 KHz

— Régler PERIOD B/TIME INT. A TO B sur PERIOD B

Période B	Rapport A/B
0.1 ms 00000000.0 ms	10^6 001.000000
0.1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

— Régler INPUT A/INPUT C sur INPUT C

Rapport C/B
10^4 00008.0000
10^6 008.000000

Comptage A
Démarrage/arrêt 000000002
Déclenché 000000001

Fréquence C
100 Hz 00080.0000 MHz
10 Hz 0080.00000 MHz
1 Hz 080000.000 KHz
0.1 Hz 80000.0000 KHz

Self check PM 6625

— Depress CHECK push-button
— Set INPUT A/INPUT C to INPUT A
— Rotate FUNCTION SELECTOR and read:

Frequency A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 kHz
0.1 Hz 10000.0000 kHz

— Set PERIOD B/TIME INT. A TO B to PERIOD B

Period B
0.1 ms 00000000.0 ms
0.1 µs 00000.0001 ms
10^2 000000100 ns
10^4 0000100.00 ns
10^6 00100.0000 ns

Ratio A/B
10^6 001.000000
10^4 00001.0000

— Set INPUT A/INPUT C to INPUT C
Ratio C/B

10^4 00016.0000
10^6 016.000000

Count A
Start/Stop 000000002
Gated 000000001

Frequency C
100 Hz 00160.0000 MHz
10 Hz 0160.00000 MHz
1 Hz 160000.000 kHz
0.1 Hz 60000.0000 kHz

Frequency A

Simple frequency measurement on sine waves and other symmetrical waveforms.
— Set FUNCTION SELECTOR to desired resolution
— Set INPUT A/INPUT C to INPUT A (only PM 6624 . . . 25)
— Set AC/DC to AC
— Pull TRIGGER LEVEL control
— Set SEP/COM to SEP
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
— Connect the input signal to input A
Display will show frequency in kHz or MHz

Frequency C PM 6624 and PM 6625

Automatic frequency measurement.
— Set FUNCTION SELECTOR to desired resolution
— Set INPUT A/INPUT C to INPUT C
— Connect the input signal to input C
Display will show frequency in MHz or kHz

Eigenkontrolle PM 6625

— Taste CHECK drücken.
— Schalter INPUT A/INPUT C auf INPUT A stellen.
— Funktionswähler drehen und dabei auf der Anzeige ablesen:

Frequenz A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 kHz
0,1 Hz 10000.0000 kHz

— Schalter PERIOD B/TIME INT. A TO B auf PERIOD B stellen und ablesen:

Periode B	Verhältnis A/B
0,1 ms 00000000.0 ms	10^6 001.000000
0,1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

— Schalter INPUT A/INPUT C auf INPUT C stellen und ablesen:

Verhältnis C/B
10^4 00016.0000
10^6 016.000000

Zählung A
Start/Stop 000000002
Torgesteuert 000000001

Frequenz C
100 Hz 00160.0000 MHz
10 Hz 0160.00000 MHz
1 Hz 160000.000 kHz
0,1 Hz 60000.0000 kHz

Frequenz A

Einfache Messungen an sinusförmigen und anderen symmetrischen Signalformen.
— Funktionswähler auf gewünschte Auflösung stellen.
— INPUT A/INPUT C auf INPUT A stellen (nur PM 6624 und PM 6625).
— AC/DC auf AC stellen.
— Einsteller TRIGGER LEVEL ziehen.
— SEP/COM auf SEP stellen.
— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V_{eff}.
— Eingangsignal an Eingang A legen.
Die Frequenz ist dann auf der Anzeige in kHz oder MHz abzulesen.

Frequenz C an PM 6624 und PM 6625

Automatische Frequenzmessung.
— Funktionswähler auf gewünschte Auflösung stellen.
— INPUT A/INPUT C auf INPUT C stellen.
— Eingangsignal an Eingang C legen.
Die Frequenz ist dann auf der Anzeige in kHz oder MHz abzulesen.

Auto Contrôle du PM 6625

— Enfoncer le bouton-poussoir CHECK
— Régler INPUT A/INPUT C sur INPUT A
— Tourner le sélecteur de fonctions et lire :

Fréquence A
100 Hz 00010.0000 MHz
10 Hz 0010.00000 MHz
1 Hz 010000.000 KHz
0.1 Hz 10000.0000 KHz

— Régler PERIOD B/TIME INT. A TO B sur PERIOD B

Période B	Rapport A/B
0.1 ms 00000000.0 ms	10^6 001.000000
0.1 µs 00000.0001 ms	10^4 00001.0000
10^2 000000100 ns	
10^4 0000100.00 ns	
10^6 00100.0000 ns	

— Régler INPUT A/INPUT C sur INPUT C
Rapport C/B
10^4 00016.0000
10^6 016.000000

Comptage A
Démarrage/arrêt 000000002
Déclenché 000000001

Fréquence C
100 Hz 00160.0000 MHz
10 Hz 0160.00000 MHz
1 Hz 160000.000 KHz
0.1 Hz 60000.0000 KHz

Fréquence A

Mesure de fréquence simple sur ondes sinusoïdales et autres ondes symétriques :
— Régler le sélecteur de fonctions sur la résolution requise
— Mettre INPUT A/INPUT C sur INPUT A (pour PM 6624 et PM 6625 seulement)
— Mettre AC/DC sur AC
— Tirer sur la commande TRIGGER LEVEL
— Mettre SEP/COM sur SEP
— Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1 V_{eff}
— Connecter le signal d'entrée à l'entrée A
L'affichage indiquera la fréquence en KHz ou en MHz

Fréquence C pour PM 6624 et PM 6625

Mesure de fréquence automatique
— Mettre le sélecteur de fonctions sur la résolution requise
— Mettre INPUT A/INPUT C sur INPUT C

Period B

Simple period measurement on sine waves and other symmetrical waveforms.
— Set FUNCTION SELECTOR to SINGLE or AVG measurement
— Set PERIOD B/TIME INT. A TO B to PERIOD B
— Pull TRIGGER LEVEL
— Set AC/DC to AC
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
— Select positive slope triggering
— Connect the signal to input B
Display will show period time in ms or ns

Time Interval A to B

Simple measurement of time interval between pulses at input A and B from separate sources.
— Set FUNCTION SELECTOR to SINGLE or AVG
— Set PERIOD B/TIME INT. A TO B to TIME INT. A TO B
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 3 V_{p-p}
— Set AC/DC to DC
— Set SEP/COM to SEP
— Select positive slope triggering
— Set TRIGGER LEVEL potentiometer to suitable trigger level e.g. 50 % of the pulse amplitude
— Connect the pulses to input A and B
Display will show the time interval in ms or ns

Ratio A/B

Simple ratio measurement on sine wave or other symmetrical waveforms.
— Set FUNCTION SELECTOR to 10^4 or 10^6
— Pull TRIGGER LEVEL control
— Set AC/DC to AC
— Set SEP/COM to SEP
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
— Connect the signal with the highest frequency to input A and the other signal to input B
Display will show the ratio of the signal frequences at input A and B

Ratio C/B PM 6624 and PM 6625

Simple ratio measurement on sine wave and other symmetrical waveforms.
— Set FUNCTION SELECTOR to 10^4 or 10^6
— Set INPUT A/INPUT C to INPUT C
— Pull TRIGGER LEVEL control
— Set SEP/COM to SEP
— Set AC/DC to AC
— Set 20 mV/200 mV to 200 mV if the

Periode B

Einfache Periodenmessung an sinusförmigen und anderen symmetrischen Signalformen.
— Funktionswähler auf SINGLE oder AVG stellen.
— PERIOD B/TIME INT. A TO B auf PERIOD B stellen.
— Einsteller TRIGGER LEVEL ziehen.
— AC/DC auf AC stellen.
— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V_{eff}.
— Triggerung auf positiver Flanke wählen.
— Signal an Eingang B legen. Die Periodendauer ist dann auf der Anzeige in ms oder ns abzulesen.

Zeitintervall A—B

Einfache Messungen des Zeitintervalls zwischen Impulsen von getrennten Quellen an Eingang A und Eingang B.
— Funktionswähler auf SINGLE oder AVG stellen.
— PERIOD B/TIME INT. A TO B auf TIME INT. A TO B stellen.
— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 3 V_{s-s}.
— AC/DC auf DC stellen.
— SEP/COM auf SEP stellen.
— Triggerung auf positiver Flanke wählen.
— Potentiometer TRIGGER LEVEL auf einen passenden Triggerpegel einstellen, z.B. 50 % der Impulsamplitude.
— Impulse an Eingang A bzw. Eingang B legen. Das Zeitintervall ist dann auf der Anzeige in ms oder ns abzulesen.

Verhältnis A/B

Einfache Verhältnismessung an sinusförmigen oder anderen symmetrischen Signalformen.
— Funktionswähler auf 10^4 oder 10^6 stellen.
— Potentiometer TRIGGER LEVEL ziehen.
— AC/DC auf AC stellen.
— SEP/COM auf SEP stellen.
— 20 mV/200 mV auf stellen, wenn das Eingangsignal größer ist als 1 V_{eff}.
— Signal mit der höheren Frequenz an Eingang A, das andere Signal an Eingang B legen.
Das Verhältnis der Signalfrequenzen an Eingang A und B ist dann auf der Anzeige abzulesen.

Verhältnis C/B an PM 6624 und PM 6625

Einfache Verhältnismessung an sinusförmigen oder anderen symmetrischen Signalformen.
— Connecter le signal d'entrée à l'entrée C
L'affichage indiquera la fréquence en MHz ou en KHz

Période B

Mesures de période simple sur ondes sinusoïdales et autres ondes symétriques
— Régler le sélecteur de fonctions sur SINGLE (simple) ou sur AVG (moyenne)
— Régler PERIOD B/ TIME INT. A TO B sur PERIOD B
— Tirer la commande TRIGGER LEVEL (niveau de déclenchement)
— Mettre AC/DC sur AC
— Régler 20 mV/200mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1 V_{eff}
— Sélectionner le déclenchement sur pente positive
— Connecter le signal à l'entrée B
L'affichage indique le temps de période en ms ou en ns

Intervalle de temps A à B

Mesure simple de temps entre impulsions aux entrées A et B à partir de sources séparées
— Mettre le sélecteur de fonctions en position SINGLE ou AVG
— Mettre PERIOD B/TIME INT. A TO B sur TIME INT. A TO B
— Régler 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 3 V_{c-c}
— Mettre AC/DC sur DC
— Mettre SEP/COM sur SEP
— Sélectionner le déclenchement sur pente positive
— Régler le potentiomètre TRIGGER LEVEL au niveau approprié, par ex 50 % de l'amplitude d'impulsion
— Connecter les impulsions aux entrées A et B
L'affichage indiquera l'intervalle de temps en ms ou en ns

Rapport A/B

Mesure simple de rapport sur onde sinusoïdale ou autres ondes symétriques
— Mettre le sélecteur de fonctions sur 10^4 ou 10^6
— Tirer la commande TRIGGER LEVEL
— Mettre AC/DC sur AC
— Mettre SEP/COM sur SEP
— Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1 V_{eff}
— Connecter le signal à fréquence la plus haute à l'entrée A, et l'autre signal à l'entrée B
L'affichage indiquera le rapport des fréquences de signaux aux entrées A et B

amplitude of the input signal is higher than 1 V_{rms}
— Connect the signal with the highest frequency to input C and the other to input B
Display will show the ratio of the signal frequencies at input C and B

Count A Start/Stop and Gated by B

Simple Start/Stop and Gated by B measurement on sine wave and other symmetrical waveforms.
— Set FUNCTION SELECTOR to COUNT A
— Pull TRIGGER LEVEL control
— Set AC/DC to AC for channel A
— Set AC/DC to DC for channel B
— Set SEP/COM to SEP
— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
— Select positive slope triggering
— Select Start/Stop by B (upper position) or Gated by B (lower position)
— Connect gating signal to input B and the other signal to input A
In Start/Stop operation the display will show the accumulated number of counts in the time interval between the Start/Stop signals, and in the Gated mode the accumulated number of counts during the positive and negative slopes of the Gating signal

Hold off PM 6622

— Set FUNCTION SELECTOR to 0.1 µs and rotate HOLD OFF control from fully CCW to fully CW position
— Read hold off time from 0.01 to 0.5 ms on the display with knob pushed and 0.5 ms to 100 ms with knob pulled

— Funktionswähler auf 10^4 oder 10^6 stellen.
— INPUT A/INPUT C auf INPUT C stellen.
— Potentiometer TRIGGER LEVEL ziehen.
— SEP/COM auf SEP stellen.
— AC/DC auf AC stellen.
— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V_{eff}.
— Signal mit der höheren Frequenz an Eingang C, das andere an Eingang B legen.
Das Verhältnis dér Signalfrequenzen an Eingang C und B ist dann auf der Anzeige abzulesen.

Zählung zwischen Start/Stopp oder torgesteuert von B

Einfache Zählung (Summenbildung) an sinusförmigen oder anderen symmetrischen Signalformen.
— Funktionswähler auf COUNT A stellen.
— Einsteller TRIGGER LEVEL ziehen.
— AC/DC für Kanal A auf AC stellen.
— AC/DC für Kanal B auf DC stellen.
— SEP/COM auf SEP stellen.
— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V_{eff}.
— Triggerung auf positiver Flanke wählen.
Im Start/Stopp-Betrieb erscheint auf der Anzeige die zwischen Start- und Stoppsignal summierte Zahl der Impulse. Bei Torsteuerung wird die Summe der Impulse während der positiven und der negativen Flanke des Torsignals gebildet.

Triggerverzögerung PM 6622

— Funktionswähler auf 0,1 µs stellen und Einsteller HOLD OFF vom Linksanschlag bis Rechtsanschlag drehen.
— Verzögerungszeiten von 0,01 bis 0,5 ms sind dann bei eingedrücktem Knopf abzulesen, Zeiten von 0,5 bis 100 ms bei gezogenem Knopf.

Rapport C/B pour PM 6624 et PM 6625

Mesure de rapport simple sur onde sinusoïdale et autres ondes symétriques
— Mettre le sélecteur de fonctions sur 10^4 et 10^6
— Mettre INPUT A/INPUT C sur INPUT C
— Tirer la commande TRIGGER LEVEL
— Mettre SEP/COM sur SEP
— Mettre AC/DC sur AC
— Régler 20 mV/200 mV sur 200 mV si l'amplitude de signal d'entrée est supérieure à 1 V_{eff}
— Connecter le signal à fréquence la plus haute à l'entrée C et l'autre à l'entrée B
L'affichage indiquera le rapport des fréquences de signaux aux entrées C et B

Comptage A Démarrage/arrêt et Déclenchement par B

Mesure simple arrêt/démarrage et déclenchement par B sur onde sinusoïdale et autres ondes symétriques
— Mettre le sélecteur de fonctions sur COUNT A
— Tirer la commande TRIGGER LEVEL
— Mettre AC/DC sur AC pour voie A
— Mettre AC/DC sur DC pour voie B
— Mettre SEP/COM sur SEP
— Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1 V_{eff}
— Sélectionner le déclenchement sur pente positive
— Sélectionner arrêt/démarrage par B (position supérieure) ou déclenchement par B (position inférieure)
— Connecter le signal de déclenchement à l'entrée B et l'autre signal à l'entrée A
En mode démarrage/arrêt, l'affichage indique le nombre de comptages accumulés dans l'intervalle de temps entre les signaux démarrage/arrêt ; et en mode de déclenchement, l'affichage indique le nombre de comptages accumulés pendant les pentes positives et négatives du signal de déclenchement (gating)

Retard de déclenchement du PM 6622

— Mettre le sélecteur de fonctions sur 0.1 µs et tourner la commande HOLD OFF de position extrême gauche en position extrême droite.
— Lire le temps de retard de 0.01 à 0.5 ms sur l'affichage avec le bouton en position enfoncée, et de 0.5 ms à 100 ms avec le bouton en position tirée.

Self check of measuring modes

Preliminary setting of the controls

— Release all push-buttons
— Minimum display time
— Pull the trigger level controls
— Hold off to position off
— Internal oscillator on
— Self check on

Frequency A

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Frequency A 100 Hz	blinking	MHz	00010.0000
Frequency A 10 Hz	blinking	MHz	0010.00000
Frequency A 1 Hz	blinking	kHz	010000.000
Frequency A 0.1 Hz	blinking	kHz	10000.0000

Frequency C PM 6624

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Frequency C 100 Hz	blinking	MHz	00080.0000
Frequency C 10 Hz	blinking	MHz	0080.00000
Frequency C 1 Hz	blinking (slow rate)	kHz	080000.000
Frequency C 0.1 Hz	blinking (slow rate)	kHz	80000.0000

Frequency C PM 6625

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Frequency C 100 Hz	blinking	MHz	00160.0000
Frequency C 10 Hz	blinking	MHz	0160.00000
Frequency C 1 Hz	blinking (slow rate)	kHz	160000.000
Frequency C 0.1 Hz	blinking (slow rate)	kHz	60000.0000

Single Period B

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Period B 0.1 ms	blinking	ms	00000000.0
Period B 0.1 µs	blinking	ms	00000.0001

Period Average B

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Period B 10^2	blinking	ns	000000100.
Period B 10^4	blinking	ns	0000100.00
Period B 10^6	blinking	ns	00100.0000

Single Time Interval A to B

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Time Int. 0.1 ms	blinking	ms	00000000.0
Time Int. 0.1 µs	blinking	ms	00000.0001

Time Interval Average A to B

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Time Int. 10^2	blinking	ns	000000000 or any value
Time Int. 10^4	blinking	ns	0000000.00 or any value
Time Int. 10^6	blinking	ns	00000.0000 or any value

Ratio A/B

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Ratio A/B 10^6	blinking	off	001.000000
Ratio A/B 10^4	blinking	off	0000.10000

Ratio C/B PM 6624

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Ratio C/B 10^6	blinking	off	008.000000
Ratio C/B 10^4	blinking	off	00008.0000

Performance Check

Ratio C/B PM 6625

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Ratio C/B 10^6	blinking	off	016.000000
Ratio C/B 10^4	blinking	off	00016.0000

Count A

— Do the preliminary setting of the controls
— Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Count A ⎍⎍⎍ B	blinking	off	000000002
Count A ⎍⎺⎍ B	blinking	off	000000001 or 000000000

Functional test of sockets and controls

Preliminary setting of the controls

— Release all push-buttons
— Minimum display time
— Pull the trigger level controls
— Hold off to position off
— Internal oscillator on

Display time

— Do the preliminary setting of the controls
— Set the function selectors to Frequency A 1 Hz
— Note that flashing frequency of the Gate lamp decreases from one flash every second to one flash every five seconds when the Display Time potentiometer is turned from the min. time position to max. time position.

Memory

— Do the preliminary setting of the controls
— Set the Function Selectors to Frequency A 1 Hz
— Set Display Time to max. position
— Observe the display and check that the counter is counting during 1 second and displays 10 000 kHz during 4 seconds when Memory push-button is depressed.

Reset

— Do the preliminary setting of the controls
— Set the Function Selectors to Frequency A 0.1 Hz
— Depress Memory push-button
— Check that counter displays zero as long as the Reset push-button is depressed.

Display digits

This test requires a 80 MHz pulse generator
— Do the preliminary setting of the controls
— Set the function selectors to Count A Gated by B
— Depress Memory push-button
— Set Trigger Level B to +2.5 V
— Connect Sync Out from the pulse generator to Input A
— Set the pulse generator to a repetition time of 1 second
— Check that digit N:o 9 is displaying all numbers from 0 to 9 when the Trigger Level B control is set from the +2.5 V position to the —2.5 V position
— Depress Reset push-button
— Set Trigger Level B control to the +2.5 V position
— Vary the Repetition Time of the pulse generator and check the remaining 8 digits as shown in table below

Digit N:o	1 (MSD)	2	3	4
Rep. time	12 ns	100 ns	1 µs	10 µs

Digit N:o	5	6	7	8	9 (LSD)
Rep. time	100 µs	1 ms	10 ms	100 ms	1 s

Trigger Level A and B

This test requires a voltmeter
— Do the preliminary setting of the controls
— Perform the test below

Trigger Level A setting	Measured voltage Monitor socket A	Trigger lamp A
—2.5 V position	—2.3 V . . . —2.7 V	off
+2.5 V position	+2.3 V . . . +2.7 V	on

— Repeat the test for Trigger Level B

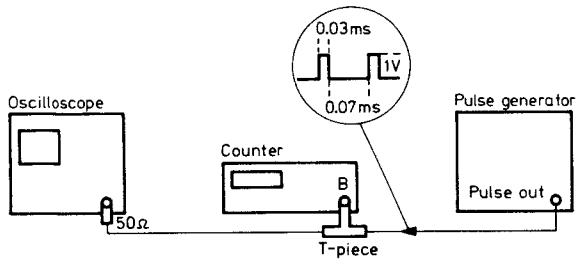
Hold off PM 6622

— Do the preliminary setting of the controls
— Set the Function Selectors to Period B 0.1 µs
— Perform the test below

Hold off setting	Displayed value
10 µs	less than 10 µs
500 µs	more than 500 µs
0.5 ms	less than 500 µs
100 ms	more than 100 ms

Positive and negative slopes A and B

This test requires a low frequency oscilloscope, a pulse generator and a BNC T-piece.
— Do the preliminary setting of the controls
— Set Function Selectors to Time Interval 0.1 µs
— Depress AC/DC push-buttons
— Set Trigger Levels A and B to approximately 0.5 V



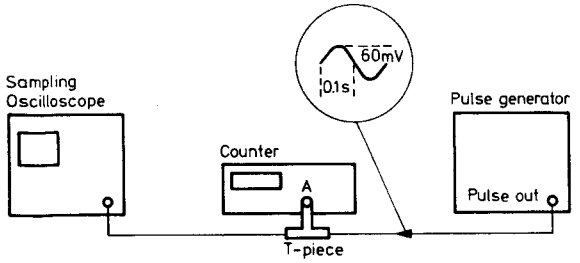
— Set the output signal from the pulse generator to an amplitude of 1 V, a repetition time of 0.1 ms and a duty factor of 0.3
— Perform the test below

Slope setting channel A	Slope setting channel B	Displayed value
		00000.1000 ms 00000.0300 ms 00000.1000 ms 00000.0700 ms

Sine wave sensitivity and ac/dc coupling Input A

This test requires a sine wave generator with a frequency range of 10 Hz to 80 MHz, a high frequency oscilloscope and a T-piece.
— Do the preliminary setting of the controls
— Set the Function Selectors to Frequency A 1 Hz

Test set up for 80 MHz measurement

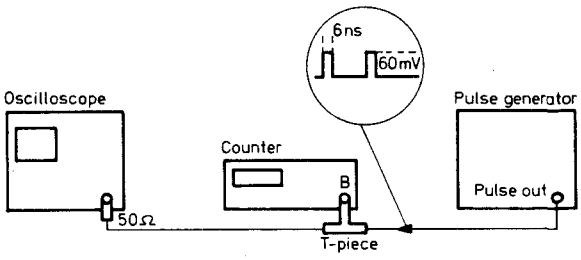


— Set the output signal from the sine wave generator to an amplitude of 60 mV_{p-p} and a frequency of 10 Hz
— Perform the test below

Sine wave frequency	Coupling ac or dc	Displayed value
10 Hz	ac	000000.000 kHz
10 Hz	dc	000000.010 kHz
100 Hz	dc	000000.100 kHz
100 kHz	dc	000100.000 kHz
80 MHz	dc	080000.000 kHz

Pulse sensitivity Input B

This test requires a 3 MHz pulse generator, a low frequency oscilloscope and a T-piece.
— Do the preliminary setting of the controls
— Set Input B to dc coupling and the Function Selectors to Period B 10^2

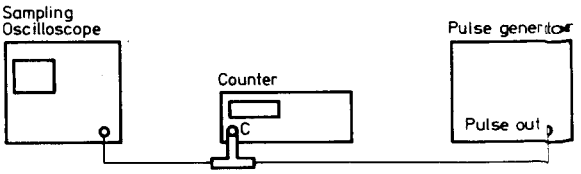


— Set the pulse generator:
Amplitude: 60 mV
Pulse width: 6 ns
Frequency: 100 Hz
Pulse mode: normal
Polarity: positive
— Adjust Trigger Level control B until counter displays correct display read out according to the table below

Pulse generator frequency	Function selector	Displayed value
100 Hz	Period B 10^2	001000000 ns
100 kHz	Period B 10^4	0010000.00 ns
3 MHz	Period B 10^6	00333.0000 ns

Sine wave sensitivity Input C PM 6624

This test requires a sine wave generator with a frequency range of 50 MHz to 520 MHz, a high frequency oscilloscope and a T-piece.
— Do the preliminary setting of the controls
— Set the Function Selectors to Frequency C 10Hz



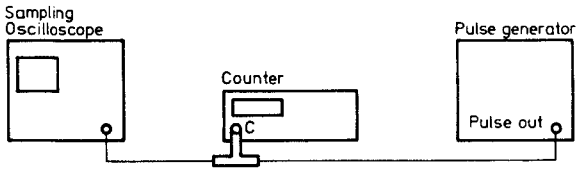
— Perform the test below

Sine wave frequency	Sine wave amplitude	Displayed value
50 MHz	30 mV_{p-p}	0050.00000 MHz
200 HMz	30 mV_{p-p}	0200.00000 MHz
520 MHz	30 mV_{p-p}	0520.00000 MHz

Performance Check

Sine wave sensitivity Input C PM 6625

This test requires a sine wave source with a frequency range of 50 MHz to 1 000 MHz, a high frequency oscilloscope and a T-piece.
— Do the preliminary setting of the controls
— Set the Function Selectors to Frequency C 10 Hz

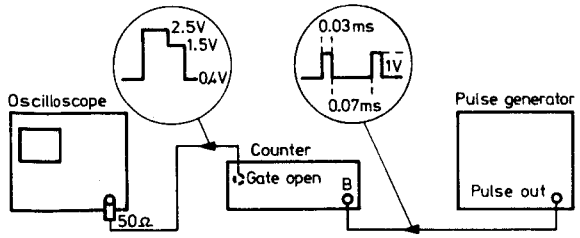


— Perform the test below

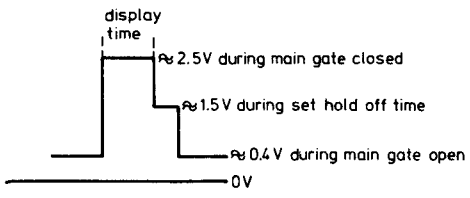
Sine wave frequency	Sine wave amplitude	Displayed value
50 MHz	30 mV_{p-p}	0050.00000 MHz
400 MHz	30 mV_{p-p}	0400.00000 MHz
960 MHz	30 mV_{p-p}	0960.00000 MHz
1 000 MHz	40 mV_{p-p}	1000.00000 MHz

Gate open PM 6622

This test requires a low frequency oscilloscope, a pulse generator and a T-piece.
— Do the preliminary setting of the controls
— Set the Function Selectors to Time Interval A to B 0.1 ms, the Hold Off time to 100 ms and depress SEP/COM push-button
— Set the amplitude of the output signal from the pulse generator to 1 V, the repetition time to 0.1 ms and the duty factor to 0.3

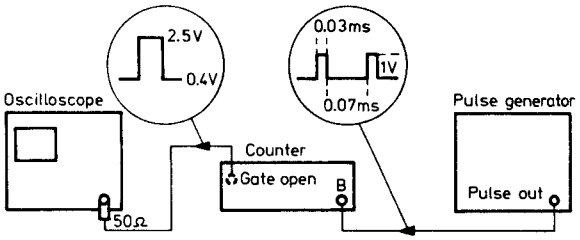


— Check that the oscilloscope displays the wave form below

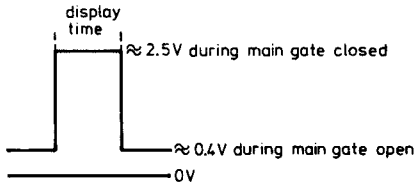


Gate open PM 6624 and PM 6625

This test requires a low frequency oscilloscope, a pulse generator and a BNC T-piece
— Do the preliminary setting of the controls
— Set Function Selectors to Time Interval A to B 0.1 ms and depress SEP/COM push-button
— Set the output signal from the pulse generator to an amplitude of 1 V, a repetition time of 0.1 ms and a duty factor of 0.3

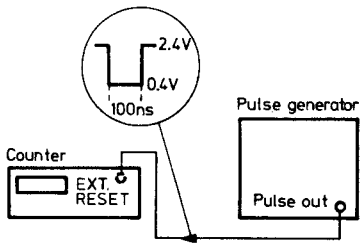


— Check that the oscilloscope displays the wave form below



External reset

This test requires a pulse generator with dc offset
— Do the preliminary setting of the controls
— Set the function selectors to Frequency A 10 Hz
— Set the Function Selectors to Frequency A 10 Hz
— Pull Display Time switch
— Depress Check push-button
— Set the pulse generator to single shot and inverted pulse mode
— Set the pulse to a width of 100 ns, an amplitude of 2 V and +0.4 V dc offset.

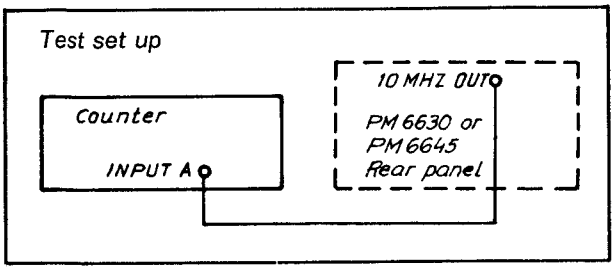


— Check that the Gate lamp is blinking and that digit N:o 1 (MSD) displays zero each time push-button Single Shot is depressed

10 MHz Out

This test requires a low frequency oscilloscope and a 500 Ω probe.
— Do the preliminary setting of the controls
— Connect the oscilloscope to socket D and check that the oscilloscope displays a wave form with an amplitude of 1.8 V_{p-p} and a frequency of 10 MHz.

Oscillator frequency check



— This check requires a frequency standard having an accuracy of 1×10^{-6}. The oven enclosed oscillators Philips PM 9680, PM 9681 and PM 9690 meet this requirement. The check should preferably be made at an ambient temperature of +25° C.

— Set the controls of the counter:

FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled

— Check that display shows 10000.000 kHz ±10 Hz.

Oscillator frequency adjustment

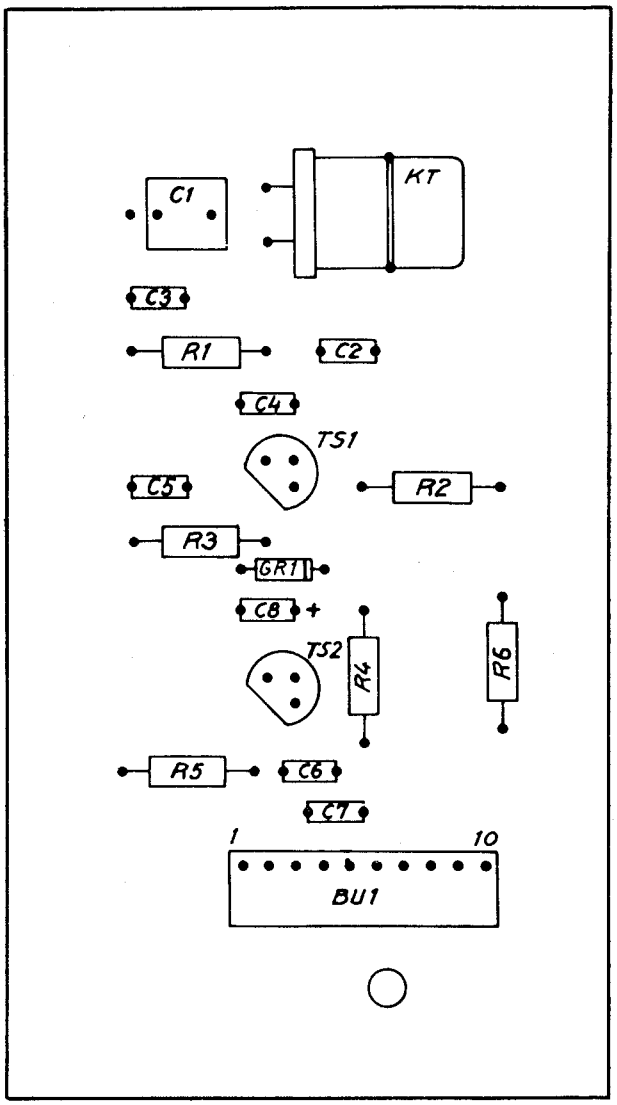
This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-6}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of +25° C.
— Remove the bottom cover of the counter.
— Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
— Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled
— Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 10 Hz.

Spare parts

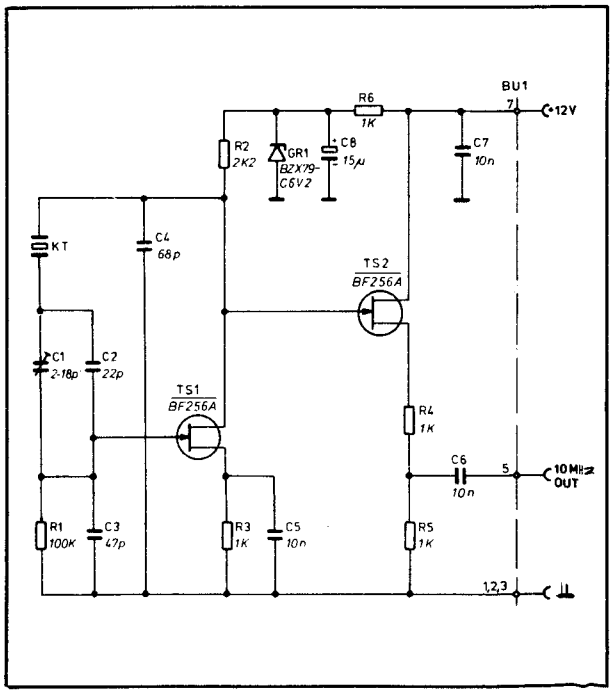
Ordering no	Ω/F	%	V/W	Item
4822 110 63161	100k	5	CR25	R1
4822 110 63116	2,2k	5	CR25	R2
4822 110 63107	1k	5	CR25	R3
4822 110 63107	1k	5	CR25	R4
4822 110 63107	1k	5	CR25	R5
4822 110 63107	1k	5	CR25	R6
5322 125 54029	2—18p		300	C1
4822 122 31063	22p	2	100	C2
4822 122 31072	47p	2	100	C3
4822 122 31076	68p	2	100	C4
5322 122 34041	10n	—20+50	100	C5
5322 122 34041	10n	—20+50	100	C6
5322 122 34041	10n	—20+50	100	C7
5322 124 14036	15µ	—10+50	16	C8

Ordering no	Description	Item
5322 130 44418	BF 256 A	TS1
5322 130 44418	BF 256 A	TS2
5322 130 30766	BZX79—C6V2	GR1
5322 242 74036	Crystal 10MHz	
5322 267 64031	Connector	BU1

Component layout

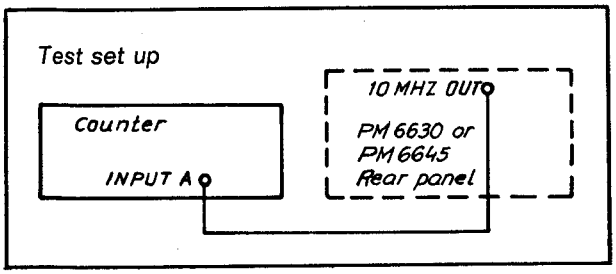


Circuit diagram



Oscillator PM 9678

Oscillator frequency check



— This check requires a frequency standard having an accuracy of 1×10^{-7}.
The oven enclosed oscillators Philips PM 9680, PM 9681 and PM 9690 meet this requirement.
The check should preferably be made at an ambient temperature of +25° C.

— Set the controls of the counter:

FUNCTION SELECTOR: FREQUENCY A 0.1 Hz
TRIGGER LEVEL A: pulled

— Check that the display shows 10000.0000 kHz ±1 Hz.

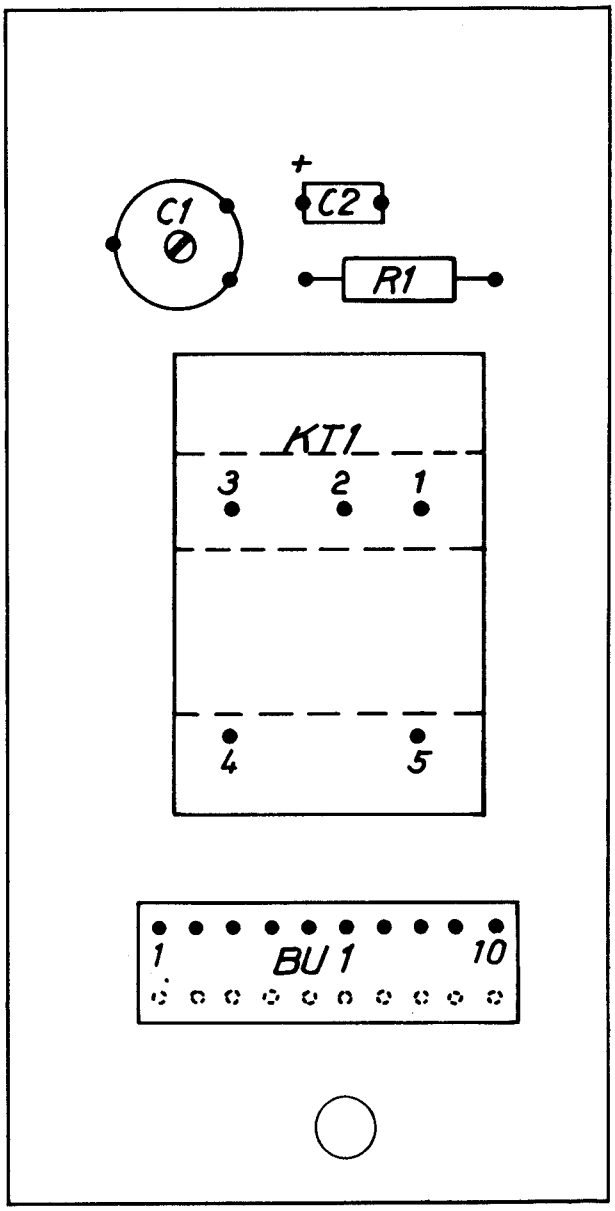
Oscillator frequency adjustment

— This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-7}$.
The oven enclosed PHILIPS oscillator PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of +25° C.
— Remove the bottom cover of the counter.
— Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
— Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled
— Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 1 Hz.
— Set FUNCTION SELECTION to position 0.1 Hz and check that display read out is the same as before. If not, adjust C 1 slightly to correct frequency.

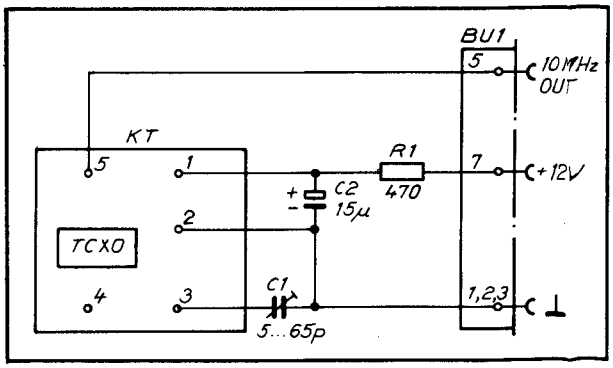
Spare parts

Ordering number	*Description*		*Item*
4822 110 63098	470 Ω 5 %		R 1
5322 125 50057	5—65 P	100 V	C 1
5322 124 14036	15 M —10+50 %	16 V	C 2
5322 267 64031	Connector		BU 1
5322 216 94047	Crystal 10 MHz		

Component layout

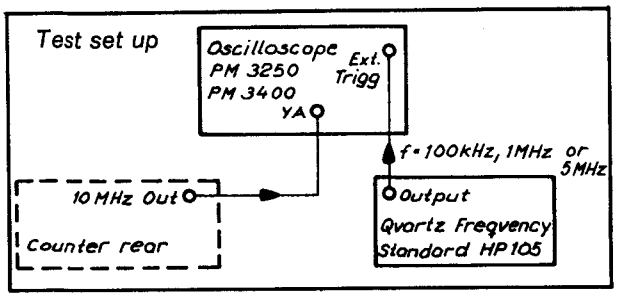


Circuit diagram



Oven Oscillators PM 9679B, PM 9690 and PM 9691

Oscillator frequency adjustment



This adjustment requires a frequency standard having an accuracy of 3×10^{-8} for PM 9679B, 10^{-9} for PM 9690 and better than 5×10^{-10} for PM 9691. Hewlett-Packard quartz frequency standard HP 105* meets this requirement.

The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.

— Remove the bottom cover of the counter
— Do the test set up
— Set the oscilloscope to 100 ns/div and adjust the oscillator's fine trimmer until the waveform on the oscilloscope moves with a velocity of maximum 1 div/10 s (0.1 Hz).

If the adjustment range is too narrow a coarse trimmer is available under the oscillator's text plate.

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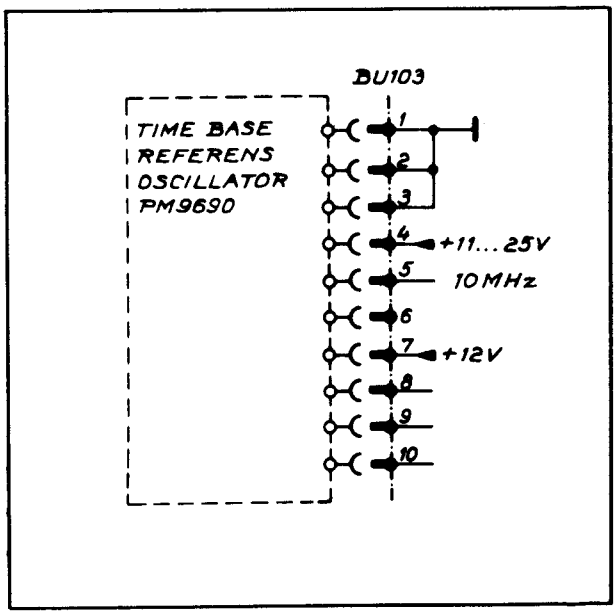
* To be adjusted against a frequency standard such as Droitwich or HBG.

Repair of the oscillator

— Repair of this oscillator may not be carried out by the local service organisations. In case of breakdown the complete sealed oscillator box has to be sent to the factory for repair.

Factory address:
PHILIPS ELEKTRONIKINDUSTRIER AB
INDUSTRIAL OPERATIONS
FACK
S-175 20 JÄRFÄLLA
SWEDEN

Pin configuration



Power supply

General

The power supply operates from 115 V AC or 230 V AC 50 to 400 Hz *or* from the internal battery PM 9673 *or* from an external battery with an output voltage of 12 to 28 V. It provides five stabilised and overload-protected voltages of +120 V, +12 V, +5 V, —5 V and —50 V.

The power supply may be divided inta the *power input circuit* mainly consisting of the mains transformer T 101 and rectifier GR 167, the *over-voltage protection circuit* mainly consisting of thyristor TS 150, TS 151 and zener diode GR 160, the *voltage regulation circuit* mainly consisting of voltage regulator IC 150, thyristor TS 154, the *DC-to-DC converter* mainly consisting of primary side of transformer T 102, driver TS 152 and switch TS 153.

Power input circuit

When the power supply operates from the *mains*, the 115 V AC or 230 V AC is transformed to 20 V AC by transformer T 101, rectified in the diode-bridge GR 167, filtered by C 152 and C 161 and fed to the power supply circuits via switch SK 121 and SK 102.

When the power supply operates from an *external battery* the current to the power supply circuits is fed from BU 21 at the rear panel via protecting diode GR 164 and switches SK 121 and SK 102.

When the internal battery is used the current is fed from pin 8 of BU 105 via SK 121 and SK 102 to the power supply circuits.

D.c. to d.c. converter

The DC to DC converter is basically a blocking oscillator consisting mainly of switch transistor TS 153 and terminals 4—9 of the transformer T 102. When switch SK 102 is set to position ON, the DC voltage from the *power input circuit* is fed to the transistor TS 155 which works as a constant current source of approximately 1 mA (I_1).

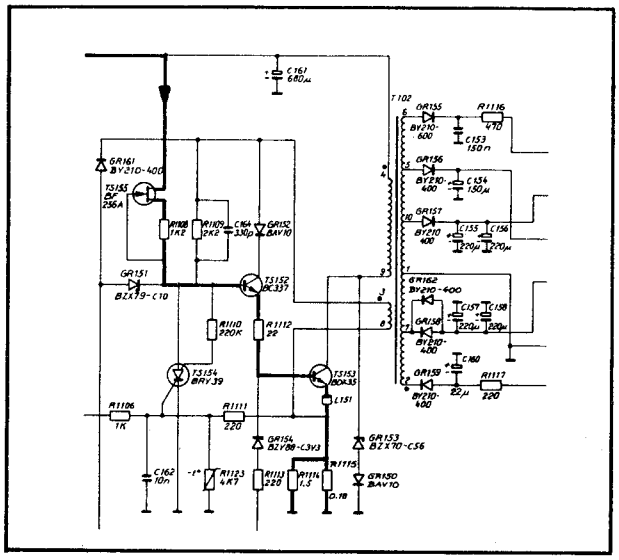
The current I_1 will cause switch transistor TS 153 to start conducting and the linearly increasing current I_2 to flow.

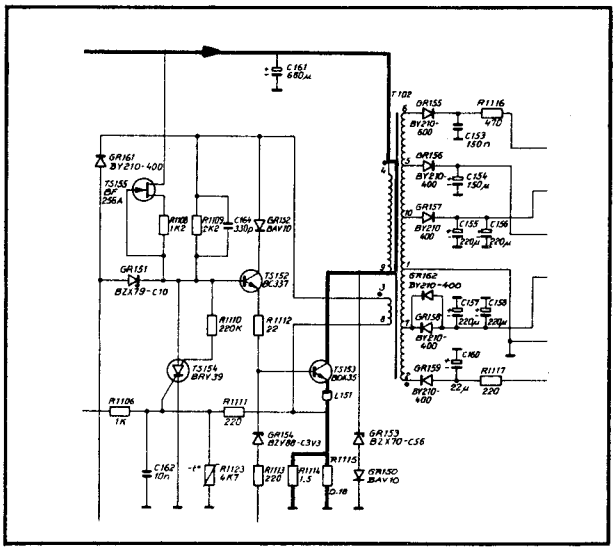
This current I_2 will cause a voltage across terminals 3—8 of the transformer and the current I_3 will start to flow.

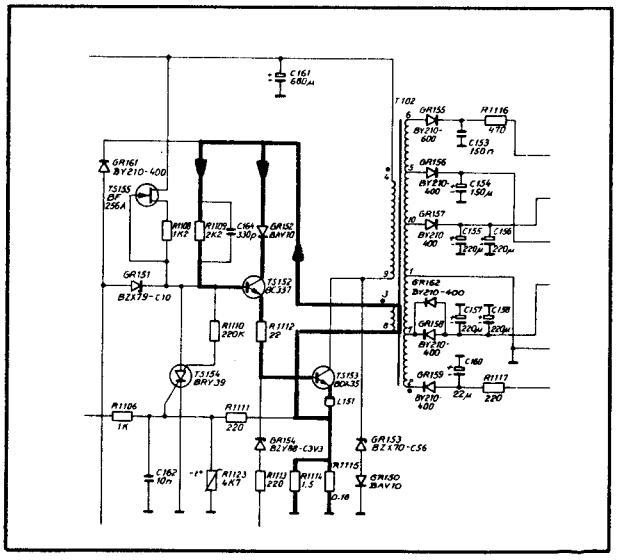
This will cause drive transistor TS 152 to saturate switch transistor TS 153. When the transistor no longer can saturate, current I_3 will stop to increase and the induced voltage at terminal 3 of transformer T 102 will disappear.

This will cause TS 153 to switch off and the collector voltage to rise to the same level as the supply voltage. At this moment the magnetic flux will discharge through the secondary windings of T 102 and diodes GR 155—159.

Current paths in d.c. to d.c. converter







Over voltage protection

The over-voltage protection circuit consists mainly of thyristors TS 150, TS 151 and zener diode GR 160.
The anode of GR 160 is connected to the +5 V output from the power supply. If this voltage increases to 5.6 V... 5.8 V, the zener diode GR 160 will start to conduct and a current will flow through resistor R 1121. The voltage drop across R 1121 is fed to the gate of thyristor TS 151 via resistor R 1120. The anode is connected to the +5 V output voltage via resistor R 1118.
The thyristor will switch on and a voltage drop arises across resistor R 1122. This voltage is fed to the gate of thyristor TS 150, whose anode is connected to the d.c. input voltage. The thyristor will switch on and blow fuse VL 150, or, if the counter is operating in the internal battery mode, fuse VL 1 in the battery unit PM 9673. The capacitor across the gate and cathode of thyristor TS 151 prevents transients from the mains to blow fuse VL 150 accidentally.

Output voltage regulation circuit

The output voltage regulation circuit consists mainly of voltage regulator IC 150 and thyristor TS 154.
The purpose of the thyristor TS 154 is to switch off the drive transistor TS 152 in order to regulate the output voltage. The switching moment of thyristor TS 154 is determined by a voltage at the gate of the thyristor which is the sum of a DC regulation voltage from terminal 10 of IC 150 and a sawtooth voltage caused by the emitter current of TS 153 through resistor R 1114//R 1115.
The voltage regulator IC 150 is fed at terminal 12 with the supply voltage and at terminal 7 with a negative voltage, via GR 161, from winding 3—8 of transformer T 102.
IC 150 contains a differential amplifier with inputs at terminals 4 and 5.
The input at terminal 5 is grounded via R 1104 and the input at terminal 4 is connected to a voltage divider that consists of the reference output at terminal 6 and the negative voltage from winding 3—8 of transformer T 102 at terminal 7.
The differential amplifier is in balance when the voltage at terminal 7 is —5 V. When the supply voltage across windings 4—9 of transformer T 102 increases, the voltage at the differential amplifier at terminal 7 of IC 150 will go more negative, the DC regulation voltage at terminal 10 of IC 150 will go positive and turn on thyristor TS 154. This will connect the base of driver transistor to the ground and cause switch transistor TS 153 to switch off. The stored magnetic flux will then discharge in the secondary windings of T 102 and diodes GR 155—GR 159.

Replacing parts in the power supply

When replacing parts in the power supply, in particular IC 150, always check the +5,0 V supply.

Proceed as follows:

— Connect a voltmeter to BU 107 pin +5,2 V and check that the voltage is 4.8—5.2 V.
If the measured voltage does not reach 4.8—5.2 V unsolder R 1103 and select a resistor value that gives the desired voltage. The value of this resistor may be 1 kΩ to 33 kΩ. Typical value is 8 kΩ.

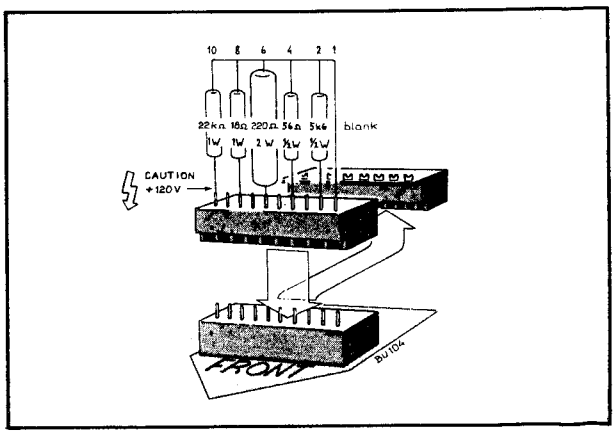
— Check the d.c. voltages.

D.C. voltages

— Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

Test point	*Measured voltage*
+120	115 . . . 130 V
+5.2	4.8 . . . 5.2 V
+12	11.5 . . . 13 V
—5.2	—5 . . . —5.4 V
—50	—50 . . . —60 V

Dummy load



A fault in the power supply can be isolated easier if the counter circuits are disconnected by removing 10-pins connector BU 107. However, to simulate the load, a dummy load has to be fitted as shown in the figure. The dummy load can be assembled of the following components:

1 female connector 10 pins	5322 267 54102
1 carbon resistor 22Ω, 1 W	4822 110 23143
1 carbon resistor 220Ω, 1 W	4822 110 23089
1 carbon resistor, 18Ω, 2 W	4822 110 10061
1 carbon resistor, 56Ω, 0.5 W	4822 110 53074
1 carbon resistor, 5.6 kΩ, 0.5 W	4822 110 53127

CAUTION: + 120 V at pin 10 of the connector!

Power Supply

Troubleshooting the power supply

Crowbar circuit. The purpose of this circuit is to blow fuse VL 150 when the +5 V voltage becomes ≈+6 V. If the fuse blows when the counter is switched on or off check TS 150. A simple way to check the performance of this circuit is to connect a dc source set to 1 A and 15 V to the external battery sockets at the rear panel of the counter and remove printed board BU 107. If the current limit lamp then turns on, indicating that TS 150 is conducting, the crowbar circuit is working properly.

Voltage regulator. The purpose of this circuits is to regulate the d.c. output levels by turning on TS 154 and stop the oscillating.

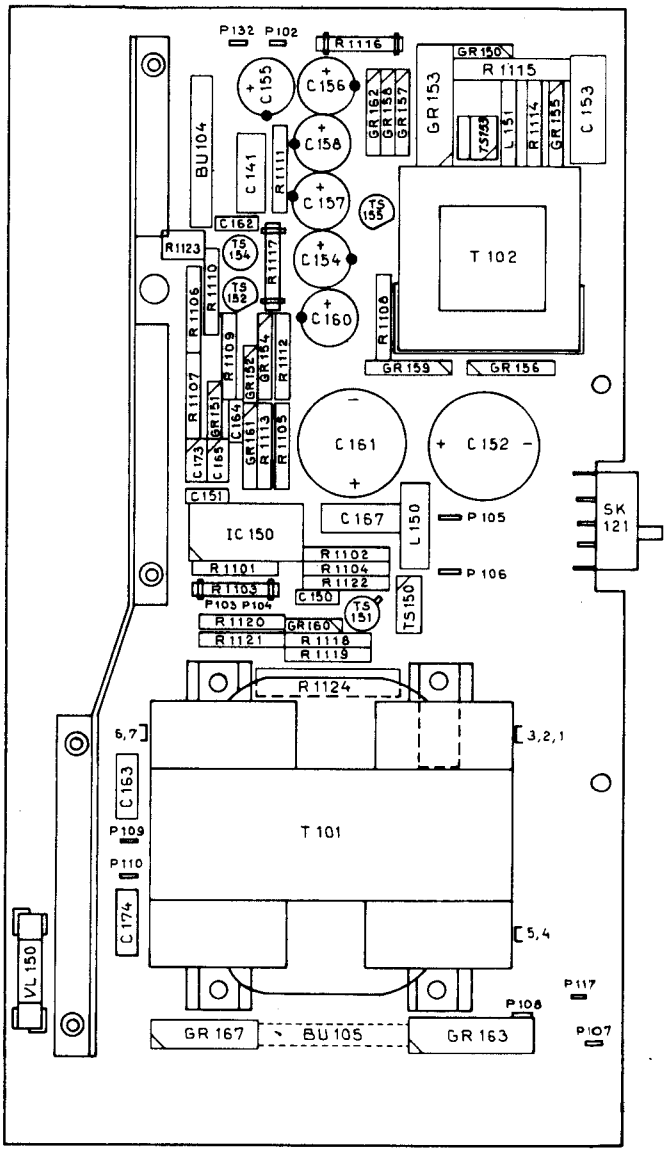
If the blocking oscillator does not oscillate check the voltage regulator by removing TS 154, if the blocking oscillator then starts to oscillate the fault may be caused by the voltage regulator.

D.c. to d.c. converter. This circuit is basically a blocking oscillator which is started by TS 155 and switched off by TS 154. If it is not oscillating check the voltage regulator and the base voltages at TS 152 (≈ 0.7 V) and TS 153 (≈ 1.4 V).

Switch off transistor TS 154. The purpose of this transistor is to switch off the blocking oscillator when the sum of the sawtooth voltage from the emitter of TS 153 and the dc voltage from terminal 10 of IC 150 becomes ≈0.5 V and turns on TS 154.

Current generator TS 155. The purpose of this transistor is to start the blocking oscillator by a bias current of ≈1 mA through base/emitter of TS 152 and TS 153. A voltage drop of ≈1 V across R1108 indicates that this circuit works properly.

Component layout power supply



General

The input amplifiers are identically, input B is, however, functionally limited to 10 MHz. In common mode the input circuits of amplifier A are disconnected and the signal is fed from input B via the separate/ common switch to amplifier A.
The signal is analogue from the input socket to amplifier IC 101 and when measuring these circuits the oscilloscope should be earthed via the earth-pin at C 102 or C 112. From IC 101 to C 103 the signal has ECL levels. The output from TS 103:C and TS 104:C is a TTL signal. When measuring the ECL and TTL signals the oscilloscope should be earthed via the earth-pin at IC 102:1.

Adjustment

D.C. balance amplifier A

— Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop	upper position
Trigg. level pot.	pulled

— Connect the voltmeter between IC 101:6 and ground and adjust R1104 until voltmeter shows 0 V ±2 mV.

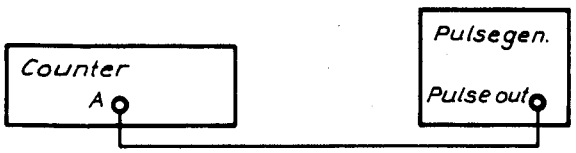
D.C. balance amplifier B

— Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop	upper position
Trigg.level pot.	pulled.

— Connect the voltmeter between IC 101:12 and ground and adjust R1104 until voltmeter shows 0 V ±2 mV.

Frequency compensation amplifier A



— Set the controls of the counter:

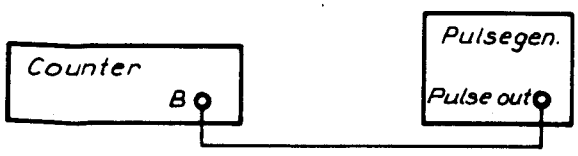
Attenuator	200 mV position

— Set the controls of the pulse generator:

Frequency	10 kHz
Amplitude	1 V
Duty factor	0.5

— Connect the oscilloscope via a well adjusted 10 MΩ/11 pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the displayed waveform.

Frequency compensation amplifier B



— Set the controls of the counter:

Attenuator 200 mV position

— Set the controls of the pulse generator:

Frequency	10 kHz
Amplitude	1 V
Duty factor	0.5

— Connect the oscilloscope via a well adjusted 10 MΩ/11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed wave form.

Functional check

Preliminary setting of the controls

— All push-buttons in released position.
— Display time potentiometer in power on position and minimum display time.
— Trigger level potentiometers in pulled position.
— Hold off in position off.
— Internal/external slide switch in position internal.

Control circuits for prescaler and check modes

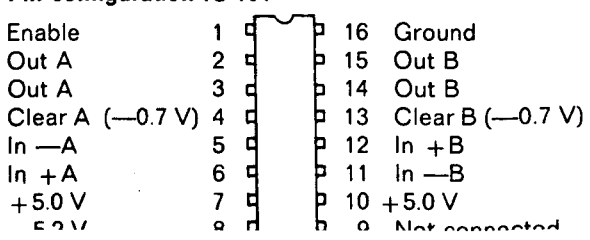
Truth table for channel A

	Check mode	Prescaler mode
SK 120		
pin 1	Floating	Ground
pin 3	Ground	
pin 4	High TTL	Ground
pin 6	Ground	
IC 101		
pin 1	Floating	Ground
pin 2	Low ECL	Don't care
pin 3	Low ECL	Don't care
IC 152		
pin 1	High TTL	Ground
pin 2	10 MHz	10 MHz
pin 3	10 MHz	High TTL
SK 108		
pin 2	High ECL	High ECL
pin 5	10 MHz ECL swing	High ECL
IC 103		
pin 5	Low ECL	Prescaler signal, ECL swing
pin 6	10 MHz ECL swing	Low ECL
IC 155:13	Low TTL	High TTL

Amplifier and Schmitt-trigger IC 101

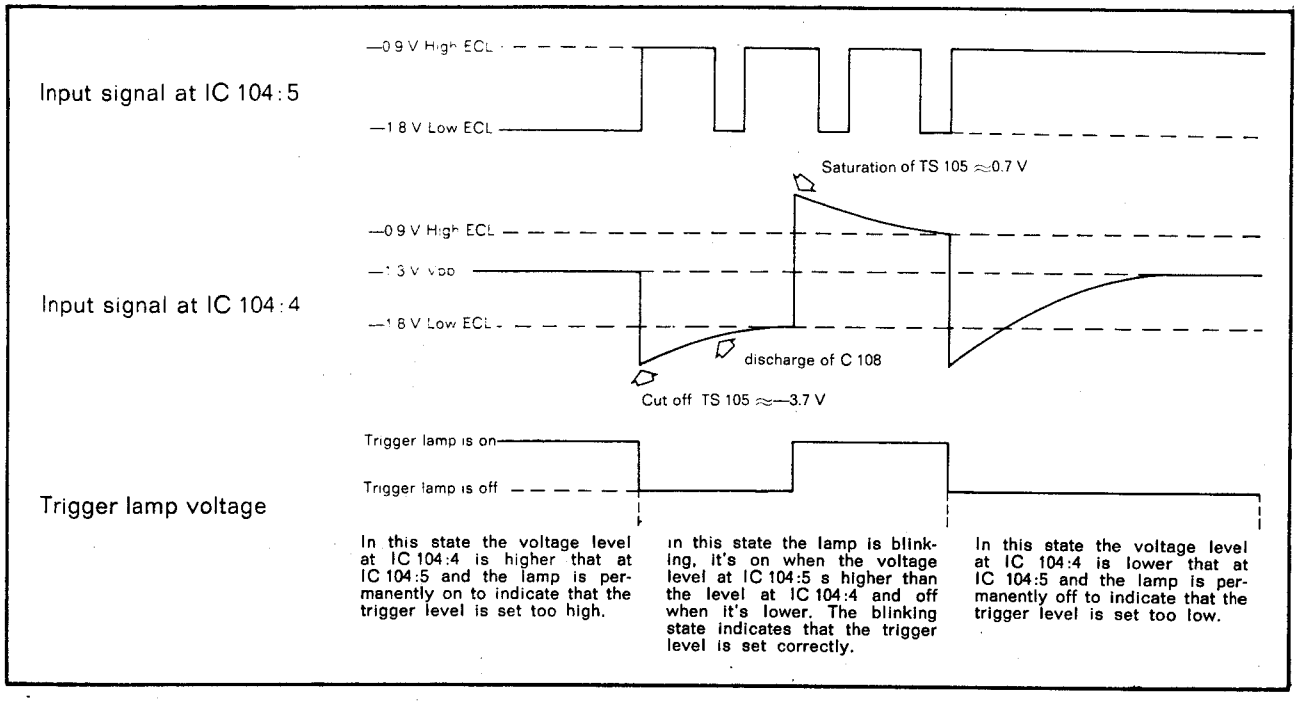
IC 101 is an amplifier and Schmitt trigger with analogue input and ECL output.

Pin configuration IC 101



Input amplifiers

Tri state trigger indicator



Truth table IC 101

Ampl. A Pin 5 and 6	Ampl. B Pin 11 and 12	Ampl. A and B Pin 2 and 14	Ampl. A and B Pin 3 and 15	Enable Pin 1
6>5		H	H	Gnd
6<5		L	H	Gnd
	12>11	H	L	Gnd
	12<11	L	H	Gnd
Don't care	Don't care	—2.2 V	2. . .2.2 V	

H = —0.8 V L = —1.8 V

ECL/TTL converter

The input signal to IC 103 from the gate circuits has ECL levels. The A1 and A2 signals has TTL levels. The emitter signals of TS 103 and TS 104 has a voltage swing of approximately —0.8 V to —1.3 V.

Prescaler level detector

The prescaler level detector will feed the signal from the prescaler unit at IC 104:10 to the ECL/TTL converter when voltage level at IC 104:9 is Vbb (—1.3 V). When the prescaler unit is not used the voltage level at IC 104:9 is low ECL.

Trigger level controls

— Do the preliminary setting of the counter.
— Depress trigger level controls and set them to fully CCW position.
— Check that the voltage at the monitor sockets are —2.7 ±0.2 V and that the trigger indicator lamps are off.
— Set the trigger level controls to CW position.
— Check that the voltage at the monitor sockets are +2.7 ±0.2 V and that the trigger indicator lamps are on.

Slope controls

— Do the preliminary setting of the controls.
— Set the function selector to time interval A to B 0.1 ns and set the separate/common selector to common position.
— Connect a pulse generator to input B and set repetition time to 100 ms, duration to 30 ms and the amplitude to 1 V.
— Set the slope controls and check the display read-out according to table below.

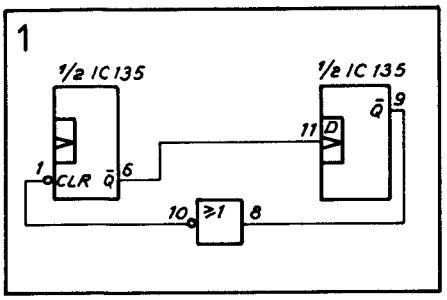
Slope setting A	and B	Display read-out	Unit
pos.	neg.	00000030.0	ms
pos.	pos.	00000100.0	ms
neg.	pos.	0000070.0	ms
neg.	neg.	00000100.0	ms

ac/dc coupling

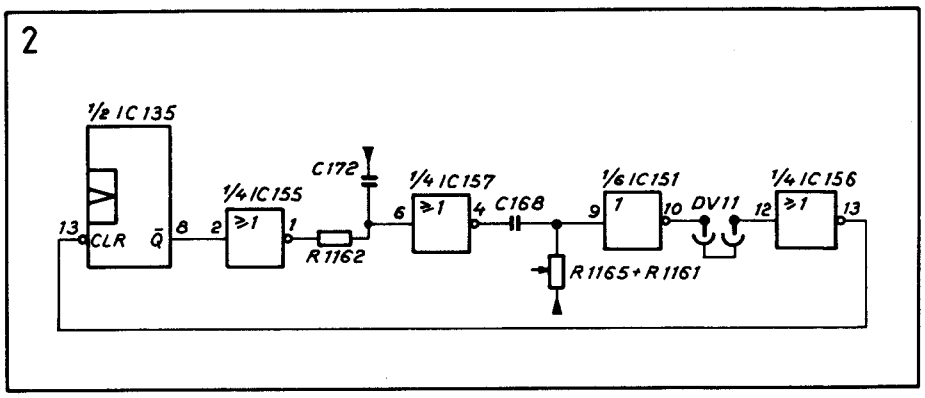
— Do the preliminary setting of the controls.
— Connect a square wave pulse with a frequency of 1 MHz, an amplitude of + 2 V and a dc level of + 2.5 V to the counter's A input.
— Set the function selector to Frequency A 1 Hz, the attenuator to 200 mV and the ac/dc selector to ac position.
— Check that display read out is 1000 kHz.
— Set ac/dc selector to dc position and check that display read out is zero.
— Set the function selectors to period B 0.1 µs, the attenuator to 200 mV and the ac/dc selector to ac position.
— Check that display read out is 0.0010 ms.
— Set ac/dc selector to dc position and reset the counter.
— Check that display read out is zero.

Main Gate and Display Time Circuits

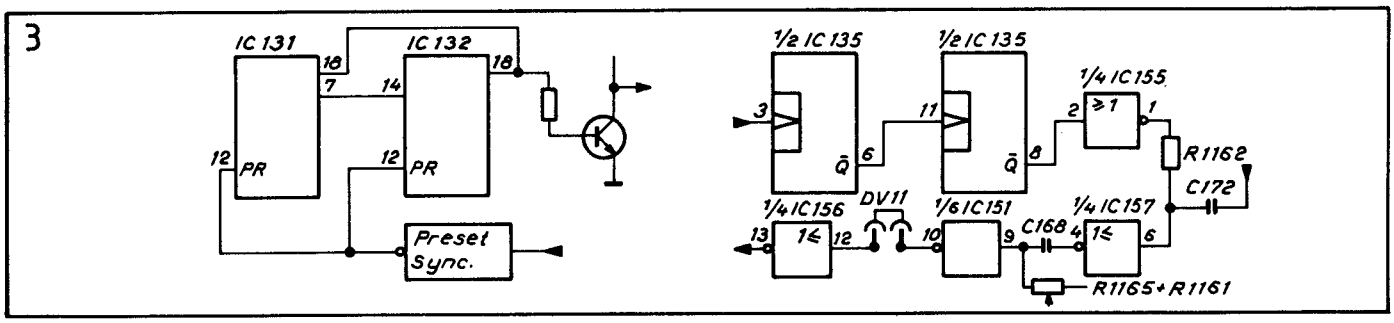
The three Reset Loops below are presented in the same order as they are closed during a Main Gate and Display time sequence.



This Reset Loop makes a Low Clear in the Main Gate flip flop in the beginning of the Display Time. See time t_2 in the timing diagram.



This Reset Loop makes a Low Clear in the Display flip flop when Reset arrives. See time t_3 in the timing diagram.



This Reset Loop makes a Low Preset in the Time Base Divider IC 131 and IC132.

Trouble shooting the Reset Loops

A fault in the Reset Loops can give fault symptoms in the Time Base, Main Gate and Display Time circuits. To isolate a fault in the Reset Loops use the following procedure.

— **Set the controls** of the counter.
Function Selectors: Single Period B 0.1 ms
Slope: positive
Attenuator: 20 mV
Coupling: dc
Trigger Level: ~0.5 V
Display Time: around mid position
Hold Off: off

— **Connect Sync Out** from a pulse generator set to Single Shot mode to Input B of the counter.

— **Reset the counter** and measure the logic levels as shown in the Reset truth table. See time t_1 in the timing diagram.

Push Single Shot once and measure the logic levels as shown in the First Single Shot truth table.
See the time interval t_1 to t_2 in the timing diagram.

Reset

Terminal / Level	:1	:2	:3	:4	:5	:6	:8	:9	:10	:11	:12	:13
IC 135	H	H		H	L	H	H	L	H	H	H	H
IC 151								H	L			
IC 154				H	L	H						
IC 155	L	H	L	L	H	L						
IC 156	L	H	H	H	L	L	L	L	H	L	L	H
IC 157				H	L	L	H	H	L	H	L	L
IC 158	L	L	H	H	H	L				L	H	H

First Single Shot

Terminal / Level	:1	:2	:3	:4	:5	:6	:8	:9	:10	:11	:12	:13
IC 135	H	L		H	H	L	H	L	H	L	H	H
IC 151								H	L			
IC 154				H	H	L						
IC 155	L	H	L	L	H	L						
IC 156	L	H	H	H	L	L	L	L	H	L	L	H
IC 157				H	L	L	L	L	H	L	L	H
IC 158	L	L	H	H	H	L				L	H	H

Logic

Push Single Shot a second time and measure the logic levels as shown in the Second Single Shot truth table immediately after the single shot is given. See time interval t_2 to t_3 in the timing diagram. This, and the following truth table, might be somewhat difficult to measure because of the influence from the RC network R1156//C173, R1159//C172 and the display time R1157+R1158//C171.

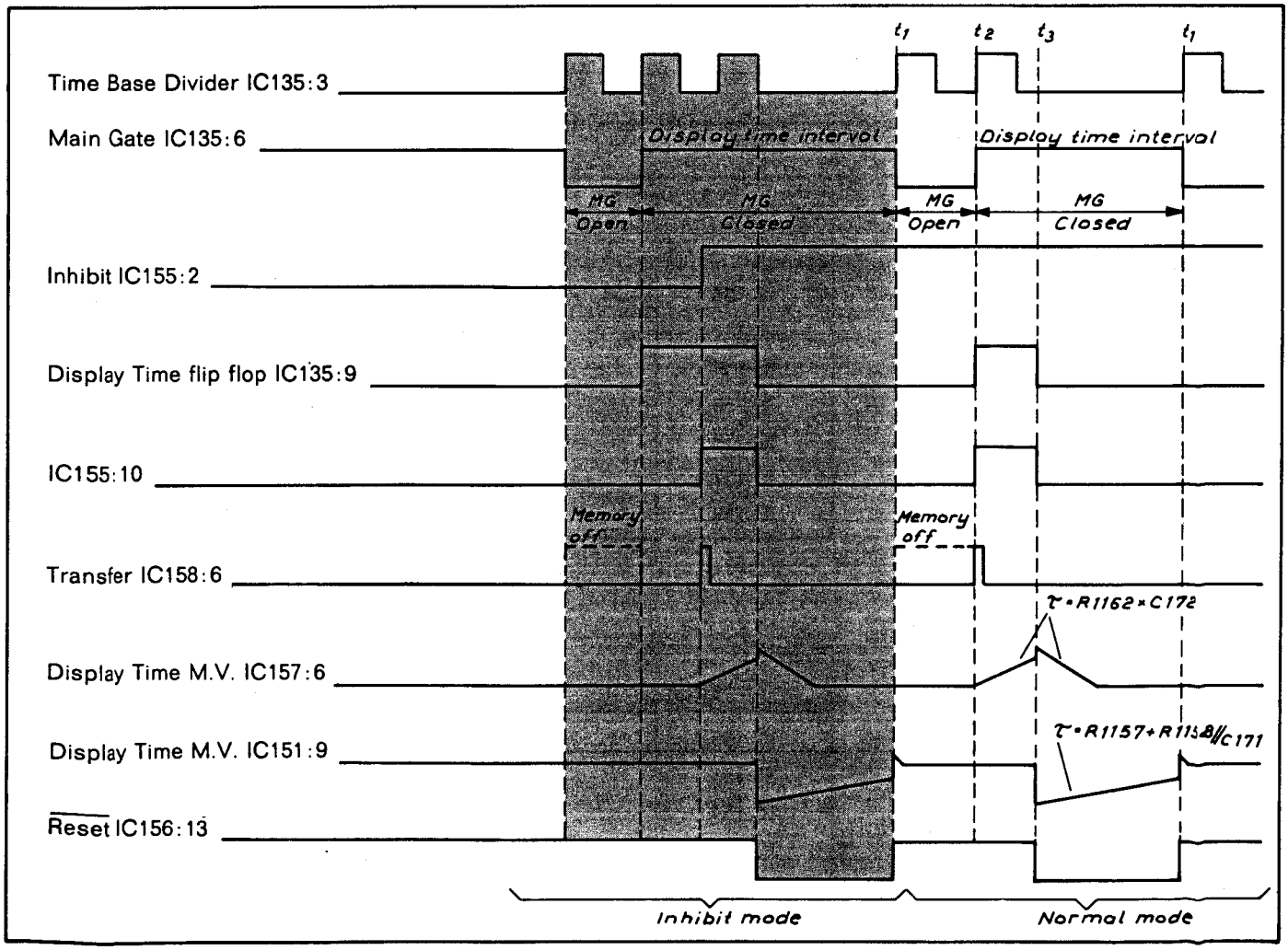
Second Single Shot

Terminal / Level	:1	:2	:3	:4	:5	:6	:8	:9	:10	:11	:12	:13
IC 135	L	H		H	L	H	L	H	H	H	L	H
IC 151								H	L			
IC 154				H	L	H						
IC 155	H	L	L	L	H	H						
IC 156	L	H	H	⊓	⌐	L	H	L	L	L	L	H
IC 157				H	H	L	H	H	L	H	L	L
IC 158	L	L	H	⊓	H	⊓				L	H	H

The last truth table shows the logic levels in the time interval t_3 to t_1 in the timing diagram.
After the display time is out the logic levels will return to what is shown in the first truth table (Reset).

t_3 to t_1

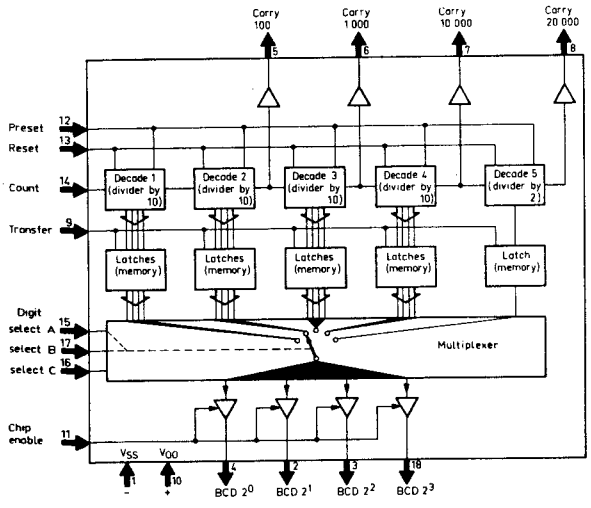
Terminal / Level	:1	:2	:3	:4	:5	:6	:8	:9	:10	:11	:12	:13
IC 135	L	H		H	L	H	H	L	H	H	H	L
IC 151								L	H			
IC 154				H	L	H						
IC 155	L	H	L	L	H	L						
IC 156	H	L	L	H	L	L	L	H	L	L	H	L
IC 157				L	H	H	H	H	L	H	L	L
IC 158	L	L	H	H	H	L				L	H	H



Quad Decade IC 132...133 and IC 177...178

The Quad Decade contains four separate decades and a flip-flop, in this application the flip-flop is not used.
The Preset Input is a common input for the decades, a High level applied to this input will preset all decades to 19999.
The Reset Input is also a common input and a High level applied to this input will reset all decades to zero.
The Count Input is an exclusive input for the first decade, the signal to be counted is applied to this input.
Each decade has a Carry Output which is connected to the Carry Input of the following decade.
All carry signals except from the first decade are available for measurement, in this application only Carry 10 000 is used.
The carry signal is active Low and its pulse width is equal to the repetition time of the signal at the Count Input.
Each decade has also a BCD output and a Latch.
The latch is a memory where the BCD information from the decades are stored.
The Transfer Input is a common input for the decades, a High Level applied to this input will open all latches and feed the BCD information stored in the latches to the multiplexer.
The Multiplexer is a programmable selector, the signals applied at the digit select inputs determines which latch the multiplexer will select, in this application input C is not used.
The BCD output is a tri state output, it can be logic 1, logic 0 or high-ohmic.
A High Level at Chip Enable Input will allow the multiplexer pass the BCD information in the preselected latch to the BCD output, a Low level makes the output high-ohmic.

Input A	Input B	Decade selection
L	L	Decade 1
H	L	Decade 2
L	H	Decade 3
H	H	Decade 4



See also the Timing Diagram in the Main Gate and Display Time description.

First Decade

The First Decade is working up to 80 MHz and is designed with discrete integrated circuits.
It contains a divider by 10 IC 174, a memory IC 175 and a gate output with open collector IC 176.

Decimal point setting

The Decimal Point Signals are fed from output 1 to 6 of the Address Decoder via the Decimal Point Switch to input 6 of the 7 Segment Decoder. A table in Logic Circuits diagram shows which settings of the Function Selector will interconnect which pins of the Decimal Point Switch and thereby connect one of the decimal point outputs from the Address Decoder to the decimal point input of the 7 Segment Decoder.

Gate Lamp Multivibrator

This circuit extends the fastest main gate signal and makes it suitable for driving the gate lamp. The input to this circuit is the main gate signal at IC 157:3 and the output is the signal to the gate lamp at BU 101:7.

Blanking Pulse Generator

This circuits turns off the display between the presentation of each digit to prevent streamers between adjacent digits.
The input to this circuits is the display clock signal at R1176 and the output is the blanking signal to the emitters of TS 180...188 and IC 181:1.
Positive going pulse from the display clock will turn off TS 177 and thereby the cathode and anode voltages to the display. Test points 6 and 7 show the display clock signal and the blanking signal.

Display

The display is a 9 digits gas discharge display, each digit has 7 segments and a decimal point.
Each one of the digits are connected to a driving transistor which is connected to an output of the Address Decoder.
A low input from the Address Decoder turns on the transistor and its digit, this is shown in oscillogram number 8 in the logic circuit diagram.
In one scanning cycle the outputs go from High to Low in the order 10:1:2:3:4:5:6:7:9, output number 10 is connected to the least significant digit and output number 9 is connected to the most significant digit.
Only one digit will be presented at a time and before the next digit is presented a blanking pulse turns off the display. The blanking pulse is shown in oscillogram number 7 in the logic circuit diagram.

Display Clock and Address Counter

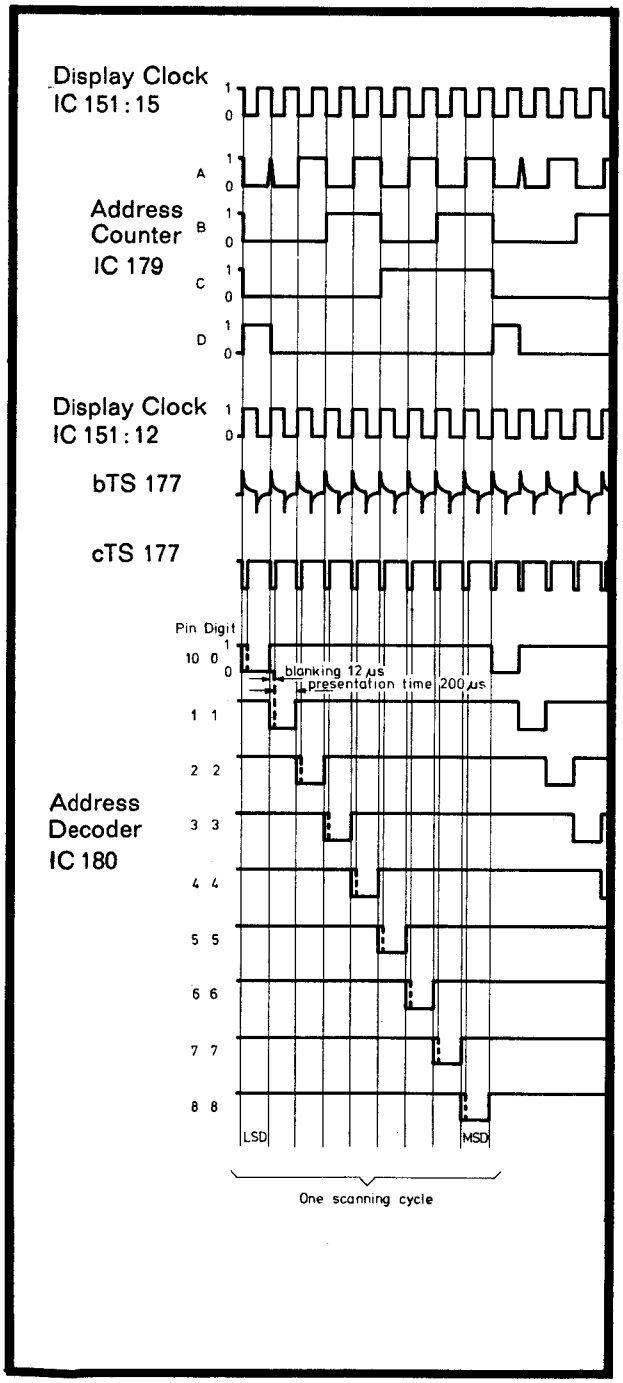
The Display Clock is an oscillator with a frequency of aproximately 5 kHz. Test point 6 shows the output from the Display Clock to the Blanking Pulse Generator.
The Address Counter is a 1 of 10 to BCD converter and it is converting the Display Clock signal from IC 151:12 to Address Signals in BCD form.

Logic

Decades and 7 Segment Decoder

The adress from the Address Counter selects which of the decades IC 176, IC 177 or IC 178 that will be presented on the display.
D bit from the Address Decoder selects the first decade, C and D bits select the first Quad Decade (2 to 5 decade) and the C bit selects the second Quad Decade (6 to 9 decade).
The A and B bits from the Address Decoder select which of the four decades in the quad decade that will be selected.
The outputs from the three decades are connected via a bus line to the 7 Segment Decoder.

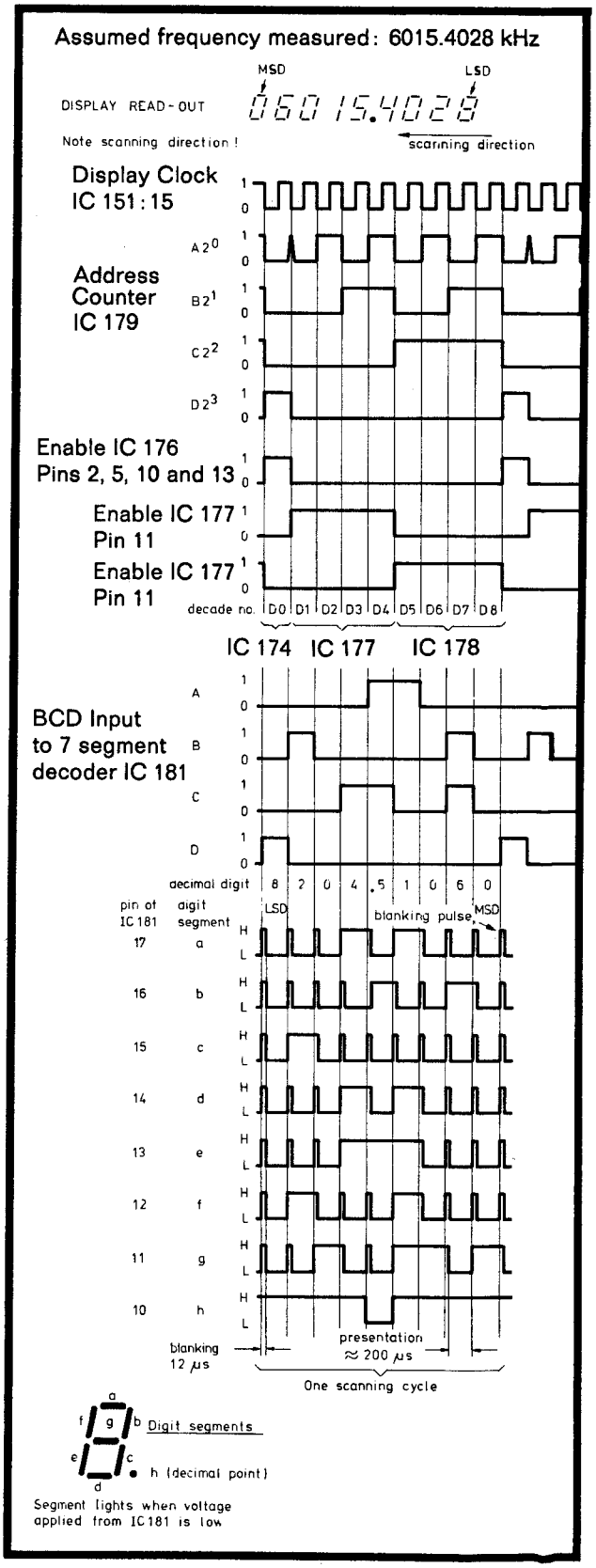
Display scanning and blanking pulse generation



Hold Off Circuits

The Hold Off Circuits extend the closing time of the Main Gate to prevent unwanted stop signals to end the measurement.

Display presentation



Ordering no	Ω	%	Type	Item
4822 110 63214	10M	10	CR25	R1003
4822 110 63189	1.2M	10	CR25	R1004
4822 110 63189	1.2M	10	CR25	R1005
4822 110 63154	56	5	CR25	R1006
5322 116 54984	68	5	PR37	R1007
4822 110 63165	150K	5	CR25	R1008
4822 110 63134	10K	5	CR25	R1009
4822 110 63134	10K	5	CR25	R1010
4822 110 63081	100	5	CR25	R1011
4822 110 60006	390	5	CR25	R1012
4822 110 63094	330	5	CR25	R1013
4822 110 63116	2.2K	5	CR25	R1017
4822 110 63092	270	5	CR25	R1018
4822 110 63087	180	5	CR25	R1019
4822 110 63107	1.0K	5	CR25	R1020
4822 110 63098	470	5	CR25	R1021
4822 110 63098	470	5	CR25	R1022
4822 110 63134	10K	5	CR25	R1023
4822 110 63109	1.2K	5	CR25	R1024
4822 110 63089	220	5	CR25	R1025
4822 110 63132	8.2K	5	CR25	R1026
4822 110 63098	470	5	CR25	R1028
4822 110 63098	470	5	CR25	R1029
4822 110 63121	3.3K	5	CR25	R1030
4822 110 63214	10M	10	CR25	R1033
4822 110 63189	1.2M	10	CR25	R1034
4822 110 63189	1.2M	10	CR25	R1035
4822 110 63154	56	5	CR25	R1036
5322 116 54984	68	5	PR37	R1037
4822 110 63165	150K	5	CR25	R1038
4822 110 63134	10K	5	CR25	R1039
4822 110 63134	10K	5	CR25	R1040
4822 110 63081	100	5	CR25	R1041
4822 110 60006	390	5	CR25	R1042
4822 110 63094	330	5	CR25	R1043
4822 110 63116	2.2K	5	CR25	R1047
4822 110 63092	270	5	CR25	R1048
4822 110 63087	180	5	CR25	R1049
4822 110 63105	820	5	CR25	R1050
4822 110 63098	470	5	CR25	R1051
4822 110 63098	470	5	CR25	R1052
4822 110 63134	10K	5	CR25	R1053
4822 110 63134	10K	5	CR25	R1054
4822 110 63089	220	5	CR25	R1055
4822 110 63098	470	5	CR25	R1058
4822 110 63098	470	5	CR25	R1059
4822 110 63121	3.3K	5	CR25	R1060
5322 116 50524	3.01K	1	MR25	R1101
5322 116 54011	5.62K	1	MR25	R1102
	SELECTED*		CR25	R1103
4822 110 63107	1.0K	5	CR25	R1104
4822 110 63121	3.3K	5	CR25	R1105
4822 110 63107	1.0K	5	CR25	R1106
4822 110 63107	1K			R1107
4822 110 63109	1.2K	5	CR25	R1108
4822 110 63116	2.2K	5	CR25	R1109
4822 110 63169	220K	5	CR25	R1110
4822 110 63089	220	5	CR25	R1111
4822 110 63063	22	5	CR25	R1112
4822 110 63089	220	5	CR25	R1113
4822 110 63032	1.5	5	CR25	R1114
5322 116 54963	0.18	10		R1115
4822 110 63098	470	5	CR25	R1116
4822 110 63089	220	5	CR25	R1117
4822 110 63072	47	5	CR25	R1118
4822 110 63169	220	5	CR25	R1119
4822 110 63107	1.0K	5	CR25	R1120
4822 110 63081	100	5	CR25	R1121
4822 110 63081	100	5	CR25	R1122
4822 116 30114	4.7K	NTC	NTC	R1123
4822 113 60084	1.0	10		R1124
4822 110 63134	10K	5	CR25	R1127
4822 110 63107	1.0	5	CR25	R1128
4822 110 63107	1.0	5	CR25	R1129
4822 110 63107	1.0	5	CR25	R1130
4822 110 63163	120K	5	CR25	R1131
4822 110 63152	47K	5	CR25	R1132
4822 110 63089	220	5	CR25	R1133

Ordering no	Ω	%	Type	Item
4822 110 63098	470	5	CR25	R1134
4822 110 63098	470	5	CR25	R1135
4822 110 63098	470	5	CR25	R1136
4822 110 63098	470	5	CR25	R1137
4822 110 63152	47K	5	CR25	R1138
4822 110 63125	4.7K	5	CR25	R1139
4822 110 63107	1.0	5	CR25	R1140
4822 110 63107	1.0	5	CR25	R1141
4822 110 63134	10K	5	CR25	R1142
4822 110 63152	47K	5	CR25	R1143
4822 110 63152	47K	5	CR25	R1144
4822 110 63152	47K	5	CR25	R1145
4822 110 63152	47K	5	CR25	R1146
4822 110 63134	10K	5	CR25	R1147
4822 110 63107	1.0	5	CR25	R1150
4822 110 63107	1.0	5	CR25	R1151
4822 110 60006	390	5	CR25	R1152
4822 110 63214	10M	10	CR25	R1153
4822 110 63143	22K	5	CR25	R1154
4822 110 63123	3.9K	5	CR25	R1156
4822 110 63107	1.0	5	CR25	R1157
4822 110 63089	220	5	CR25	R1158
4822 110 63134	10K	5	CR25	R1160
4822 110 63134	10K	5	CR25	R1161
4822 110 63187	1M	5	CR25	R1162
4822 110 63134	10K	5	CR25	R1163
4822 110 63107	1.0	5	CR25	R1164
4822 110 63125	4.7K	5	CR25	R1166
4822 110 63114	1.8K	5	CR25	R1167
4822 110 63114	1.8K	5	CR25	R1168
4822 110 63185	820K	5	CR25	R1170
4822 110 63098	470	5	CR25	R1171
4822 110 63098	470	5	CR25	R1172
4822 110 63114	1.8K	5	CR25	R1173
4822 110 63114	1.8K	5	CR25	R1174
4822 110 63116	2.2K	5	CR25	R1175
4822 110 63125	4.7K	5	CR25	R1176
4822 110 63143	22K	5	CR25	R1177
4822 110 63129	6.8K	5	CR25	R1178
4822 110 63138	15K	5	CR25	R1180
4822 110 63138	15K	5	CR25	R1181
4822 110 63138	15K	5	CR25	R1182
4822 110 63138	15K	5	CR25	R1183
4822 110 63138	15K	5	CR25	R1184
4822 110 63138	15K	5	CR25	R1185
4822 110 63138	15K	5	CR25	R1186
4822 110 63138	15K	5	CR25	R1187
4822 110 63138	15K	5	CR25	R1188
4822 110 63098	470	5	CR25	R1189
4822 110 63116	2.2K	5	CR25	R1190
4822 110 63116	2.2K	5	CR25	R1191
4822 110 63116	2.2K	5	CR25	R1192
4822 110 63116	2.2K	5	CR25	R1193
4822 110 63116	2.2K	5	CR25	R1194
4822 110 63116	2.2K	5	CR25	R1195
4822 110 63116	2.2K	5	CR25	R1196
4822 110 63116	2.2K	5	CR25	R1197

Ordering no	Ω	Description	Item
5322 101 14011	100	TRIMM POTM	R1014
5322 101 64017	47K	SK109	R1015
5322 101 14011	100	TRIMM POTM	R1044
5322 101 64017	47K	SK119	R1045
5322 101 94007	1M	SK101 SK102	R1165

Ordering no	F	%	V	Item
4822 121 40407	22N	10	630	C101
4822 122 31076	68P	2	100	C103
4822 122 31168	270P	2	500	C104
4822 122 31072	47P	2	100	C105
5322 122 34041	10N	+20+50	100	C106
5322 121 40323	100N	10	100	C107
5322 124 14053	33M	+10+50	10	C108
4822 121 40407	22N	10	630	C111
4822 122 31076	68P	2	100	C113

Basic board

Ordering no	F	%	V	Item
4822 122 31168	270P	2	500	C114
4822 122 31072	47P	2	100	C115
5322 122 34041	10N	-20+50	100	C116
5322 121 40323	100N	10	100	C117
5322 124 14053	33M	-10+50	100	C118
4822 122 31081	100P	2	100	C119
5322 124 14053	33M	-10+50	10	C121
5322 122 34041	10N	-20+50	100	C122
5322 124 14053	33M	-10+50	10	C123
5322 122 34041	10N	-20+50	100	C124
5322 122 34041	10N	-20+50	100	C125
5322 122 34041	10N	-20+50	100	C126
5322 122 34041	10N	-20+50	100	C127
5322 122 34041	10N	-20+50	100	C128
5322 122 34041	10N	-20+50	100	C129
4822 121 40407	22N	10	630	C130
4822 122 31036	2.2P	2	100	C131
5322 122 34041	10N	-20+50	100	C132
5322 124 14053	33M	-10+50	10	C133
5322 124 14053	33M	-10+50	10	C134
5322 122 34041	10N	-20+50	100	C136
5322 122 34041	10N	-20+50	100	C137
4822 124 10197	47M	-10+50	6.3	C139
4822 124 10197	47M	-10+50	6.3	C140
4822 121 40232	220N	10	100	C141
5322 122 34041	10N	-20+50	100	C144
4822 122 30113	180P	2	100	C146
5322 122 34041	10N	-20+50	100	C147
5322 122 34041	10N	-20+50	100	C150
4822 122 31081	100P			C151
4822 124 20534	680M	-10+50	40	C152
4822 121 40104	150N	10	250	C153
4822 124 20586	150M	-10+50	16	C154
4822 124 20589	220M	-10+50	10	C155
4822 124 20589	220M	-10+50	10	C156
4822 124 20589	220M	-10+50	10	C157
4822 124 20499	22M	-10+50	63	C160
4822 124 20534	680M	-10+50	40	C161
5322 122 34041	10N	-20+50	100	C162
5322 124 24116	1M			C163
4822 122 31165	330P	10	100	C164
5322 124 14075	1M	-10+50	25	C165
5322 122 34041	10N	-20+50	100	C166
4822 121 40232	220N	10	100	C167
5322 124 14066	10M	-10+50	6.3	C168
5322 122 34041	10N	-20+50	100	C169
4822 122 31081	100P	2	100	C170
5322 121 40323	100N	10	100	C172
5322 121 40323	100N	10	100	C176
4822 122 30114	2.2N	10	100	C178
5322 122 34041	10N	-20+50	100	C179
4822 121 41156	68N	10	250	C180
5322 121 44137	68N	10	250	C181
5322 121 44137	68N	10	250	C182
5322 121 44137	68N	10	250	C183
5322 121 44137	68N	10	250	C184
5322 121 44137	68N	10	250	C185
5322 121 44137	68N	10	250	C186
5322 121 44137	68N	10	250	C187
5322 121 44137	68N	10	250	C188
4822 121 40104	150N	10	250	C189

Ordering no	F	V	Item
5322 125 54024	2-9P	300	C102
5322 125 54024	2-9P	300	C112

Ordering no	Description	Item
5322 130 44578	E411 SILICONIX	TS101
5322 130 44578	E411 SILICONIX	TS102
5322 130 44435	2N5770	TS103
5322 130 44435	2N5770	TS104
5322 130 44215	MPSL08	TS105
5322 130 44215	MPSL08	TS106
5322 130 40407	2N2369	TS142
4822 130 40855	BC337	TS146

Ordering no	Description	Item
5322 130 24035	BT100A-02	TS150
5322 130 40482	BRY39	TS151
4822 130 40855	BC337	TS152
5322 130 44417	BDX35	TS153
5322 130 40482	BRY39	TS154
5322 130 44418	BF256A	TS155
4822 130 40937	BC548B	TS156
5322 130 44256	BC557	TS177
5322 130 44247	BSS68	TS180
5322 130 44247	BSS68	TS181
5322 130 44247	BSS68	TS182
5322 130 44247	BSS68	TS183
5322 130 44247	BSS68	TS184
5322 130 44247	BSS68	TS185
5322 130 44247	BSS68	TS186
5322 130 44247	BSS68	TS187
5322 130 44247	BSS68	TS188
5322 209 85408	MC1651L	IC101
5322 209 84643	MC10102P	IC102
5322 209 85409	GXB10110	IC103
5322 209 84825	MC10216P	IC104
5322 209 84183	SN74S74N	IC125
5322 209 84183	SN74S74N	IC126
5322 209 84304	SN75107AN	IC127
5322 209 85406	N74LS54A	IC128
5322 209 84628	N7403A	IC129
5322 209 84528	SN7400N	IC130
5322 209 84722	GZF1201P MOS	IC131
5322 209 84722	GZF1201P MOS	IC132
5322 209 85001	SN74LS157N	IC133
5322 209 84996	SN74LS10N	IC134
5322 209 84183	SN74LS74N	IC135
5322 209 84724	SN74S64N	IC136
5322 209 85407	N74S02A	IC137
5322 209 84655	723PC	IC150
5322 209 85085	F34049PC SELECTED	IC151
5322 209 84983	SN74LS00N	IC152
5322 209 85412	CD4093BE MOS	IC153
5322 209 84983	SN74LS00N	IC154
5322 209 84993	SN74LS02N	IC155
5322 209 84993	SN74LS02N	IC156
5322 209 84976	ICF4001PC	IC157
5322 209 84983	SN74LS00N	IC158
5322 209 84984	SN74LS04N	IC159
5322 209 85411	74S196	IC174
5322 209 80059	74LS75	IC175
5322 209 84529	SN7403N	IC176
5322 209 84722	GZF1201P MOS	IC177
5322 209 84722	GZF1201P MOS	IC178
5322 209 80072	SN7490AN	IC179
5322 209 80142	SN7442AN	IC180
5322 209 84723	DM8884AN	IC181
5322 111 94015	6X1.0K	IC190
5322 111 94015	6X1.0K	IC191
5322 111 94031	6X47K	IC192
5322 111 94031	6X47K	IC193
5322 111 94012	6X6.8K	IC194
5322 111 94012	6X6.8K	IC195
5322 111 94031	6X47K	IC196
5322 111 94012	6X6.8K	IC197
5322 111 94026	6X470K	IC198
4822 130 30509	BZY88-C4V3	GR101
5322 130 30613	BAW62	GR102
5322 130 30613	BAW62	GR103
4822 130 30509	BZY88-C4V3	GR104
5322 130 34563	BZX79-C2V7	GR105
5322 130 30613	BAW62	GR106
5322 130 34563	BZX79-C2V7	GR107
5322 130 30613	BAW62	GR108
4822 130 30509	BZY88-C4V3	GR111
5322 130 30613	BAW62	GR112
5322 130 30613	BAW62	GR113
4822 130 30509	BZY88-C4V3	GR114
5322 130 34563	BZX79-C2V7	GR115
5322 130 30613	BAW62	GR116
5322 130 34563	BZX79-C2V7	GR117
5322 130 30613	BAW62	GR118

Ordering no	Description	Item
5322 130 30613	BAW62	GR121
5322 130 34047	BZX75-C1V4	GR122
5322 130 30613	BAW62	GR125
5322 130 30613	BAW62	GR138
5322 130 30613	BAW62	GR139
5322 130 30613	BAW62	GR140
5322 130 30613	BAW62	GR141
5322 130 30613	BAW62	GR142
5322 130 30613	BAW62	GR143
5322 130 30613	BAW62	GR144
5322 130 30613	BAW62	GR145
5322 130 30594	BAV10	GR150
5322 130 30774	BZX79-C10	GR151
5322 130 30594	BAV10	GR152
5322 130 34401	BZX70-C56	GR153
5322 130 30392	BZY88-C3V3	GR154
4822 130 30868	BY207	GR155
4822 130 30839	BY206	GR156
4822 130 30868	BY210-400	GR157
4822 130 30868	BY210-400	GR158
4822 130 30839	BY206	GR159
5322 130 34167	BZX79-B6V2	GR160
4822 130 30868	BY210-400	GR161
5322 130 30192	BY126	GR163
5322 130 30414	BY164	GR167
5322 130 30613	BAW62	GR170
5322 130 34049	BZX75-C2V1	GR171
5322 130 30613	BAW62	GR172
5322 130 30613	BAW62	GR173
5322 130 30613	BAW62	GR175
5322 130 34189	BAW20	GR180
5322 130 34189	BAW20	GR181
5322 130 34189	BAW20	GR182
5322 130 34189	BAW20	GR183
5322 130 34189	BAW20	GR184
5322 130 34189	BAW20	GR185
5322 130 34189	BAW20	GR186
5322 130 34189	BAW20	GR187
5322 130 34189	BAW20	GR188
5322 130 34166	BZX79-C51	GR189

Ordering no	Description	Item
4822 252 20001	THERMAL FUSE	VL101
5322 131 94042	DISPLAY	B101
5322 462 34127	GUIDE RAIL	FOR U1
5322 158 10289	INDUCTANCE 0,68MH	L101
5322 158 10289	INDUCTANCE 0,68MH	L102
5322 158 10243	INDUCTANCE 100MH	L103
5322 158 10284	INDUCTANCE 47MH	L104
5322 158 10284	INDUCTANCE 47MH	L105
5322 158 10052	CHOKE	L150
4822 526 10097	FXC BEAD	L151
5322 158 10052	CHOKE	L152

Ordering no	Description	Item
5322 456 14054	TEXT PLATE	PM6622
5322 456 14055	TEXT PLATE	PM6624
5322 456 14056	TEXT PLATE	PM6625
5322 450 64059	WINDOW	
5322 414 34076	FUNCTION KNOB	SK105
5322 414 74019	COVER FUNCTION KNOB	SK105
5322 414 34091	DISPLAY KNOB	SK101
5322 414 74015	COVER DISPLAY KNOB	SK101
5322 414 34091	HOLD OFF KNOB	SK403
5322 414 74015	COVER HOLD OFF KNOB	SK403
5322 414 34091	TRIGGER KNOBS	
5322 414 74015	COVER TRIGGER KNOBS	
5322 414 14011	PUSH BUTTON KNOBS	
5322 267 10004	INPUT SOCKETS A B	BU1 BU2

Ordering no	Description	Item
5322 267 34059	EXT BATTERY SOCKET	BU21
5322 267 34059	EXT BATTERY SOCKET	BU22
5322 265 30066	MAINS INPUT SOCKET	BU23
5322 267 10004	INPUT D-10MHZ OUT	BU24
5322 267 10004	EXT. RESET	BU25
5322 267 10004	GATE OPEN	BU27
5322 277 24017	INT EXT STD SWITCH	SK22

Ordering no	Description	Item
5322 256 34031	FUSEHOLDER	VL150
5322 255 44107	IC HOLDER 16 PINS	D.I.L
5322 255 44112	IC HOLDER 18 PINS	D.I.L
5322 255 40089	TRANSISTOR HOLDER	TO 18-3
5322 255 40089	TRANSISTOR HOLDER	TO 18-4
5322 265 54006	TRANSISTOR HOLDER	TS153
5322 265 54006	FEMALE CONNECTOR	BU 102
5322 265 54018	MALE CONNECTOR	BU 102
5322 265 44064	MALE CONNECTOR	BU103
5322 265 44064	MALE CONNECTOR	BU104
5322 265 44064	MALE CONNECTOR	BU105
5322 255 44107	FEMALE CONNECTOR	BU106
5322 265 54006	FEMALE CONNECTOR	BU107
5322 101 94007	COMBINED SWITCH	SK101
5322 101 94007	COMBINED SWITCH	SK102
5322 276 14117	PUSH BUTTON SWITCH	SK103
5322 276 14117	PUSH BUTTON SWITCH	SK104
5322 273 74008	ROTARY SWITCH	SK105
5322 276 14117	PUSH BUTTON SWITCH	SK106
5322 276 14117	PUSH BUTTON SWITCH	SK107
5322 276 14117	PUSH BUTTON SWITCH	SK108
5322 101 64017	COMBINED SWITCH	SK109
5322 276 14117	PUSH BUTTON SWITCH	SK110
5322 276 14117	PUSH BUTTON SWITCH	SK116
5322 276 14117	PUSH BUTTON SWITCH	SK117
5322 276 14117	PUSH BUTTON SWITCH	SK118
5322 101 64017	COMBINED SWITCH	SK119
5322 276 14117	PUSH BUTTON SWITCH	SK120
5322 277 24006	SLIDE SWITCH	SK121
5322 146 14079	MAINS TRANSFORMER	T101
5322 142 64027	DC-DC TRANSFORMER	T102
4822 253 20022	FUSE 1.6A FAST	VL150

Ordering no	Description	Qty
5322 498 54048	HANDLE ARM	2
5322 498 54054	HANDLE PROFILE	1
5322 520 34164	BEARING BUSH	2
5322 414 64053	CAP HANDLE ARM	2
5322 447 84467	TOP COVER	1
5322 447 84466	BOTTON COVER	1
5322 466 85335	FRONT ORNAMENT	1
5322 459 24054	REAR ORNAMENT	1
5322 462 44181	REAR FOOT	4
5322 462 44179	BOTTON FOOT	4
4822 462 70497	PLUG BOTTOM FOOT	4

Ordering no	Description	Item
5322 321 24389	CABLE COMPLETE	U3 TO U1
5322 268 24073	TEST SOCKET	BU302
5322 268 24073	TEST SOCKET	BU303
5322 130 34562	LD35/II	GR301
5322 130 34562	LD35/II	GR302
5322 130 34562	LD35/II	GR303
5322 130 34562	LD35/II	GR304
5322 130 34562	LD35/II	GR305
5322 130 34562	LD35/II	GR306
5322 130 34562	LD35/II	GR307

Ordering no	Description	Item
5322 321 24391	CABLE COMPLETE	U4 TO U1
5322 277 24006	SLIDE SWITCH	SK401
5322 277 24006	SLIDE SWITCH	SK402
5322 101 54008	COMBINED SK403-SK404	R401
5322 121 54118	CAPACITOR 150NF 63V	C401

Prescaler PM 6624

Ordering no	Ω	%	Type	Item
4822 116 51142	150	5	PR37	R201
5322 116 54396	68	5	PR52	R202
5322 116 54396	68	5	PR52	R203
5322 116 50417	162	5	MR25	R204
4822 111 30328	330	5	CR16	R205
4822 110 63125	4.7K	5	CR25	R206
4822 110 63147	33K	5	CR25	R207
4822 110 63107	1K	5	CR25	R208
4822 110 63125	4.7K	5	CR25	R209
4822 110 63152	47K	5	CR25	R210
4822 110 63107	1K	5	CR25	R211
4822 110 63138	15K	5	CR25	R212
4822 111 30067	33	5	CR16	R213
4822 110 63134	10K	5	CR25	R214
4822 110 63141	18K	5	CR25	R215
4822 110 63101	560	5	CR25	R216
4822 111 30264	2.7K	5	CR16	R217
4822 111 30323	270	5	CR16	R218
4822 111 30272	680	5	CR16	R219
4822 111 30245	47	5	CR16	R220
4822 111 30347	10	5	CR16	R221
4822 110 63161	100K	5	CR25	R222
4822 110 63116	2.2K	5	CR25	R223
4822 110 63125	4.7K	5	CR25	R224
4822 110 63134	10K	5	CR25	R225
4822 110 63098	470	5	CR25	R226
4822 110 63116	2.2K	5	CR25	R227
4822 110 63054	10	5	CR25	R228
4822 111 30272	680	5	CR25	R229
4822 110 63098	470	5	CR25	R230
4822 110 63116	2.2K	5	CR25	R231
4822 110 63125	4.7K	5	CR25	R238

Ordering no	Description	Item
5322 158 14119	COIL	L201
5322 158 14119	COIL	L202
5322 158 10276	INDUCTANCE 4.7MH	L203
5322 158 14119	COIL	L204
4822 526 10025	FXC BEAD	L205
4822 526 10025	FXC BEAD	L207
4822 526 10025	FXC BEAD	L208
4822 526 10025	FXC BEAD	L209
4822 526 10025	FXC BEAD	L210
5322 526 14019	BEAD	L211

5322 265 54006	FEMALE CONNECTOR	BU201	1
5322 265 54018	MALE CONNECTOR	BU201	1
5322 535 94711	DISTANCE PIECE	FOR U2	2
5322 462 34054	GUIDE RAIL	FOR U2	2
5322 255 44122	IC HOLDER 14 PINS	DIL	1
5322 255 40089	TRANSISTOR HOLDER	TO18-3	2

Ordering no	F	%	V	Item
4822 122 31177	470P	10	100	C201
4822 122 31177	470P	10	100	C202
4822 122 31177	470P	10	100	C203
4822 122 31177	470P	10	10	C204
4822 122 30043	10N	-20+80	63	C205
5322 122 34043	47P	2	50	C206
4822 122 31175	1N	10	100	C207
5322 124 14079	68M		6.3	C208
4822 122 31043	3.9P	2	63	C209
4822 122 31173	220P	10	100	C211
4822 122 30094	220P	10	100	C212
4822 122 31177	470P	10	100	C213
4822 122 30043	10N	-20+80	63	C214
5322 124 14036	15M		16	C215
4822 122 31175	1N	10	100	C216
5322 122 34043	47P	2	100	C217
4822 122 31072	47P	10	100	C218
4822 122 30043	10N	-20+80	63	C219
4822 122 31175	1N	10	100	C220
5322 122 34043	47P	2	50	C221
4822 122 31175	1N	10	100	C222
4822 122 31175	1N	10	100	C223
5322 124 14079	68M		6.3	C224
4822 122 30043	10N	-20+80	63	C225
4822 122 31072	47P	10	100	C226
4822 122 31173	220P	10	100	C227

Ordering no	Description	Item
5322 130 34283	HP5082-2835	GR203
5322 130 34283	HP5082-2835	GR204
5322 130 34364	BA379	GR205
5322 130 34364	BA379	GR206
5322 130 34364	BA379	GR207
5322 130 30613	BAW62	GR208
5322 130 34283	HP5082-2835	GR209
5322 130 34283	HP5082-2835	GR210
5322 130 30666	BZX79-C7V5	GR211
5322 209 85414	OM334	IC201
5322 209 85414	OM334	IC202
5322 209 84721	SP670B	IC203
5322 209 84163	SN72741P	IC204
5322 209 84163	SN72741P	IC205
5322 209 84165	SN7474N	IC206
5322 209 84165	SN7474N	IC207
4822 130 40937	BC548B	TS201
5322 130 40348	BC178B	TS202
5322 130 44179	BFR90	TS203
4822 130 40937	BC548B	TS204
5322 130 40343	BC108B	TS205
5322 130 34364	BA379	GR201
5322 130 34364	BA379	GR202

Ordering no	Ω	%	Type	Item
5322 116 54393	150	5	PR52	R201
5322 116 54396	68	5	PR52	R202
5322 116 54396	68	5	PR52	R203
5322 116 50417	162	5	MR25	R204
4822 111 30328	330	5	CR16	R205
4822 110 63125	4.7K	5	CR25	R206
4822 110 63147	33K	5	CR25	R207
4822 110 63107	1K	5	CR25	R208
4822 110 63125	4.7K	5	CR25	R209
4822 110 63152	47K	5	CR25	R210
4822 110 63107	1K	5	CR25	R211
4822 110 63138	15K	5	CR25	R212
4822 111 30348	27	5	CR16	R213
4822 110 63134	10K	5	CR25	R214
4822 110 63141	18K	5	CR25	R215
4822 110 63094	330	5	CR25	R216
4822 111 30265	2.2K	5	CR16	R217
4822 111 30331	470	5	CR16	R218
4822 111 30312	4.7K	5	CR16	R219
4822 111 30327	220	5	CR16	R220
4822 111 30347	10	5	CR16	R221
4822 110 63161	100K	5	CR25	R222
4822 110 63116	2.2K	5	CR25	R223
4822 110 63116	2.2K	5	CR25	R224
4822 110 63134	10K	5	CR25	R225
4822 110 63098	470	5	CR25	R226
4822 110 63116	2.2K	5	CR25	R227
4822 110 63054	10	5	CR25	R228
4822 111 30272	680	5	CR16	R229
4822 110 63098	470	5	CR25	R230
4822 110 63116	2.2K	5	CR25	R231
4822 111 30324	100	5	CR16	R233
4822 111 30328	330	5	CR16	R234
4822 111 30328	330	5	CR16	R235
4822 110 63098	470	5	CR16	R236
4822 110 63069	39	5	CR16	R237
4822 110 63125	4.7K	5	CR16	R238

Ordering no	F	%	V	Item
5322 122 34071	470P	20	50	C201
5322 122 34071	470P	20	50	C202
5322 122 34071	470P	20	50	C203
5322 122 34071	470P	20	50	C204
4822 122 30043	10N	-20+80	63	C205
5322 122 34043	47P	10	50	C206
4822 122 31175	1N	10	100	C207
5322 124 14079	68M	-10+50	6.3	C208
5322 122 34043	47P	10	50	C209
4822 122 31173	220P	10	100	C210
4822 122 31173	220P	10	100	C211
4822 122 31173	220P	10	100	C212
5322 122 34071	470P	10	50	C213
4822 122 30043	10N	-20+80	63	C214
5322 124 14036	15M	-10+50	16	C215
4822 122 31175	1N	10	100	C216
5322 122 34071	470P	20	50	C217
5322 122 34042	12P	10	50	C218
4822 122 30043	10N	-20+80	63	C219
4822 122 31175	1N	10	100	C220
4822 122 30043	10N	-20+80	63	C221
5322 122 34043	47P	10	50	C222
5322 122 34071	470P	20	50	C223
5322 124 14079	68M	-10+50	6.3	C224
5322 122 34071	470P	10	50	C225
4822 122 31072	47P	2	100	C226
5322 122 34071	470P	20	50	C227
4822 122 31072	47P	2	100	C228
4822 122 30043	10N	-20+80	63	C229
5322 122 34043	47P	10	50	C230
4822 122 31054	10P	2	100	C231

Ordering no	Description	Item
5322 158 14119	COIL	L201
5322 158 14119	COIL	L202
5322 158 10276	INDUCTANCE 4.7MH	L203
5322 158 14119	COIL	L204
5322 158 14119	COIL	L205
5322 158 14119	COIL	L206
5322 158 14119	COIL	L207
5322 158 14119	COIL	L208
5322 157 44024	COIL	L209
4822 526 10025	FXC BEAD	L210
4822 526 10025	FXC BEAD	L211
4822 526 10025	FXC BEAD	L212
4822 526 10025	FXC BEAD	L214
5322 265 54006	FEMALE CONNECTOR BU201	1
5322 265 54018	MALE CONNECTOR BU201	1
5322 535 94711	DISTANCE PIECE FOR U2	2
5322 255 44122	IC HOLDER 14 PINS DIL	1
5322 255 40089	TRANSISTOR HOLDER TO18-3	2
5322 462 34054	GUIDE RAIL	2

Ordering no	Description	Item
5322 209 85414	OM334	IC201
5322 209 85414	OM334	IC202
5322 209 84725	SP8616B	IC203
5322 209 84165	SN72741P	IC204
5322 209 84165	SN72741P	IC205
5322 209 84165	SN7474N	IC206
5322 209 84165	SN7474N	IC207
5322 209 84729	SP8600B	IC208
4822 130 40937	BC548B	TS201
5322 130 40348	BC178B	TS202
5322 130 44179	BFR90	TS203
4822 130 40937	BC548B	TS204
5322 130 40343	BC108B	TS205
5322 130 44435	2N5770	TS206
5322 130 34364	BA379	GR201
5322 130 34364	BA379	GR202
5322 130 34283	HP5082-2835	GR203
5322 130 34283	HP5082-2835	GR204
5322 130 34364	BA379	GR205
5322 130 34364	BA379	GR206
5322 130 34364	BA379	GR207
5322 130 30613	BAW62	GR208
5322 130 34283	HP5082-2835	GR209
5322 130 34283	HP5082-2835	GR210
5322 130 30666	BZX79-C7V5	GR211
5322 130 34364	BA379	GR212
5322 130 30666	BZX79-C7V5	GR213
5322 130 30411	BZX79-C3V9	GR214
5322 130 30411	BZX79-C3V9	GR215

CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS
(excl. potentiometric recorders)

The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.

① Country	② Day Month Year	③ Typenumber /Version	④ Factory/Serial no.
3 2	1 5 0 4 7 5	0 P M 3 2 6 0 0 2	D O 0 0 7 8 3

CODED FAILURE DESCRIPTION ⑥

⑤ *Nature of call*

- ☐ Installation
- ☐ Pre sale repair
- ☐ Preventive maintenance
- ☒ Corrective maintenance
- ☐ Other

Location: 0 0 2 1

Component/sequence no.: T S 0 6 0 7 / R 0 0 6 3 1 / 9 9 0 0 0 1

Category: 5 / 2 / 4

⑦ *Job completed*: ☒

Working time ⑧: ☐ ☐ 1 2 Hrs

Detailed description of the information to be entered in the various boxes:

①Country: 3 2 = Switzerland

②Day Month Year 1 5 0 4 7 5 = 15 April 1975

③Type number/Version O P M 3 2 6 0 0 2 = Oscilloscope PM 3260, version 02 (in later oscilloscopes this number is placed in front of the serial no)

④Factory/Serial number D O 0 0 7 8 3 = DO 783 These data are mentioned on the type plate of the instrument

⑤ Nature of call: Enter a cross in the relevant box

⑥ Coded failure description

Location

☐☐☐☐

These four boxes are used to isolate the problem area. Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).

Example: 0001 for Unit 1
000A for Unit A
0075 for item 75

If units are not numbered, do not fill in the four boxes; see Example Job sheet.

Component/sequence no.

☐☐☐☐☐☐

These six boxes are intended to pinpoint the faulty component.

A. Enter the component designation as used in the circuit diagram. If the designation is alfa-numeric, the letters must be written (starting from the left) in the two left-hand boxes and the figures must be written (in such a way that the last digit occupies the right-most box) in the four right-hand boxes.

B. Parts not identified in the circuit diagram:

990000 Unknown/Not applicable
990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002 Knob (incl. dial knob, cap, etc.)
990003 Probe (only if attached to instrument)
990004 Leads and associated plugs
990005 Holder (valve, transistor, fuse, board, etc.)
990006 Complete unit (p.w. board, h.t. unit, etc.)
990007 Accessory (only those without type number)
990008 Documentation (manual, supplement, etc.)
990009 Foreign object
990099 Miscellaneous

Category

☐

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement (of transistor, resistor, etc.)
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

⑦ Job completed: Enter a cross when the job has been completed.

⑧ Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

☐ ☐ 1 2 = 1,2 working hours (1 h 12 min.)

Ordering no	Ω	%	Type	Item
5322 116 54393	150	5	PR52	R201
5322 116 54396	68	5	PR52	R202
5322 116 54396	68	5	PR52	R203
5322 116 50417	162	5	MR25	R204
4822 111 30328	330	5	CR16	R205
4822 110 63125	4.7K	5	CR25	R206
4822 110 63147	33K	5	CR25	R207
4822 110 63107	1K	5	CR25	R208
4822 110 63125	4.7K	5	CR25	R209
4822 110 63152	47K	5	CR25	R210
4822 110 63107	1K	5	CR25	R211
4822 110 63138	15K	5	CR25	R212
4822 111 30348	27	5	CR16	R213
4822 110 63134	10K	5	CR25	R214
4822 110 63141	18K	5	CR25	R215
4822 110 63094	330	5	CR25	R216
4822 111 30265	2.2K	5	CR16	R217
4822 111 30331	470	5	CR16	R218
4822 111 30312	4.7K	5	CR16	R219
4822 111 30327	220	5	CR16	R220
4822 111 30347	10	5	CR16	R221
4822 110 63161	100K	5	CR25	R222
4822 110 63116	2.2K	5	CR25	R223
4822 110 63116	2.2K	5	CR25	R224
4822 110 63134	10K	5	CR25	R225
4822 110 63098	470	5	CR25	R226
4822 110 63116	2.2K	5	CR25	R227
4822 110 63054	10	5	CR25	R228
4822 111 30272	680	5	CR16	R229
4822 110 63098	470	5	CR25	R230
4822 110 63116	2.2K	5	CR25	R231
4822 111 30324	100	5	CR16	R233
4822 111 30328	330	5	CR16	R234
4822 111 30328	330	5	CR16	R235
4822 110 63098	470	5	CR16	R236
4822 110 63069	39	5	CR16	R237
4822 110 63125	4.7K	5	CR16	R238

Ordering no	F	%	V	Item
5322 122 34071	470P	20	50	C201
5322 122 34071	470P	20	50	C202
5322 122 34071	470P	20	50	C203
5322 122 34071	470P	20	50	C204
4822 122 30043	10N	-20+80	63	C205
5322 122 34043	47P	10	50	C206
4822 122 31175	1N	10	100	C207
5322 124 14079	68M	-10+50	6.3	C208
5322 122 34043	47P	10	50	C209
4822 122 31173	220P	10	100	C210
4822 122 31173	220P	10	100	C211
4822 122 31173	220P	10	100	C212
5322 122 34071	470P	10	50	C213
4822 122 30043	10N	-20+80	63	C214
5322 124 14036	15M	-10+50	16	C215
4822 122 31175	1N	10	100	C216
5322 122 34071	470P	20	50	C217
5322 122 34042	12P	10	50	C218
4822 122 30043	10N	-20+80	63	C219
4822 122 31175	1N	10	100	C220
4822 122 30043	10N	-20+80	63	C221
5322 122 34043	47P	10	50	C222
5322 122 34071	470P	20	50	C223
5322 124 14079	68M	-10+50	6.3	C224
5322 122 34071	470P	10	50	C225
4822 122 31072	47P	2	100	C226
5322 122 34071	470P	20	50	C227
4822 122 31072	47P	2	100	C228
4822 122 30043	10N	-20+80	63	C229
5322 122 34043	47P	10	50	C230
4822 122 31054	10P	2	100	C231

Ordering no	Description	Item
5322 209 85414	OM334	IC201
5322 209 85414	OM334	IC202
5322 209 84725	SP8616B	IC203
5322 209 84165	SN72741P	IC204
5322 209 84165	SN72741P	IC205
5322 209 84165	SN7474N	IC206
5322 209 84165	SN7474N	IC207
5322 209 84729	SP8600B	IC208
4822 130 40937	BC548B	TS201
5322 130 40348	BC178B	TS202
5322 130 44179	BFR90	TS203
4822 130 40937	BC548B	TS204
5322 130 40343	BC108B	TS205
5322 130 44435	2N5770	TS206
5322 130 34364	BA379	GR201
5322 130 34364	BA379	GR202
5322 130 34283	HP5082-2835	GR203
5322 130 34283	HP5082-2835	GR204
5322 130 34364	BA379	GR205
5322 130 34364	BA379	GR206
5322 130 34364	BA379	GR207
5322 130 30613	BAW62	GR208
5322 130 34283	HP5082-2835	GR209
5322 130 34283	HP5082-2835	GR210
5322 130 30666	BZX79-C7V5	GR211
5322 130 34364	BA379	GR212
5322 130 30666	BZX79-C7V5	GR213
5322 130 30411	BZX79-C3V9	GR214
5322 130 30411	BZX79-C3V9	GR215

Ordering no	Description	Item
5322 158 14119	COIL	L201
5322 158 14119	COIL	L202
5322 158 10276	INDUCTANCE 4.7MH	L203
5322 158 14119	COIL	L204
5322 158 14119	COIL	L205
5322 158 14119	COIL	L206
5322 158 14119	COIL	L207
5322 158 14119	COIL	L208
5322 157 44024	COIL	L209
4822 526 10025	FXC BEAD	L210
4822 526 10025	FXC BEAD	L211
4822 526 10025	FXC BEAD	L212
4822 526 10025	FXC BEAD	L214
5322 265 54006	FEMALE CONNECTOR BU201	1
5322 265 54018	MALE CONNECTOR BU201	1
5322 535 94711	DISTANCE PIECE FOR U2	2
5322 255 44122	IC HOLDER 14 PINS DIL	1
5322 255 40089	TRANSISTOR HOLDER TO18-3	2
5322 462 34054	GUIDE RAIL	2

CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS
(excl. potentiometric recorders)

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① Country	② Day Month Year	③ Typenumber /Version	④ Factory/Serial no.
3 2	1 5 0 4 7 5	0 P M 3 2 6 0 0 2	D O 0 0 7 8 3

CODED FAILURE DESCRIPTION ⑥

⑤ *Nature of call*

- ☐ Installation
- ☐ Pre sale repair
- ☐ Preventive maintenance
- ☒ Corrective maintenance
- ☐ Other

Location: 0 0 2 1

Component/sequence no.: T S 0 6 0 7 / R 0 0 6 3 1 / 9 9 0 0 0 1

Category: 5 / 2 / 4

⑦ *Job completed*: ☒

Working time ⑧: ☐ ☐ 1 2 Hrs

Detailed description of the information to be entered in the various boxes:

①Country: 3 2 = Switzerland

②Day Month Year 1 5 0 4 7 5 = 15 April 1975

③Type number/Version O P M 3 2 6 0 0 2 = Oscilloscope PM 3260, version 02 (in later oscilloscopes this number is placed in front of the serial no)

④Factory/Serial number D O 0 0 7 8 3 = DO 783 These data are mentioned on the type plate of the instrument

⑤ Nature of call: Enter a cross in the relevant box

⑥ Coded failure description

Location

☐☐☐☐

These four boxes are used to isolate the problem area. Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).

Example: 0001 for Unit 1
000A for Unit A
0075 for item 75

If units are not numbered, do not fill in the four boxes; see Example Job sheet.

Component/sequence no.

☐☐☐☐☐☐

These six boxes are intended to pinpoint the faulty component.

A. Enter the component designation as used in the circuit diagram. If the designation is alfa-numeric,the letters must be written (starting from the left) in the two left-hand boxes and the figures must be written (in such a way that the last digit occupies the right-most box) in the four right-hand boxes.

B. Parts not identified in the circuit diagram:

990000 Unknown/Not applicable
990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002 Knob (incl. dial knob, cap, etc.)
990003 Probe (only if attached to instrument)
990004 Leads and associated plugs
990005 Holder (valve,transistor, fuse, board, etc.)
990006 Complete unit (p.w. board, h.t. unit, etc.)
990007 Accessory (only those without type number)
990008 Documentation (manual, supplement, etc.)
990009 Foreign object
990099 Miscellaneous

Category

☐

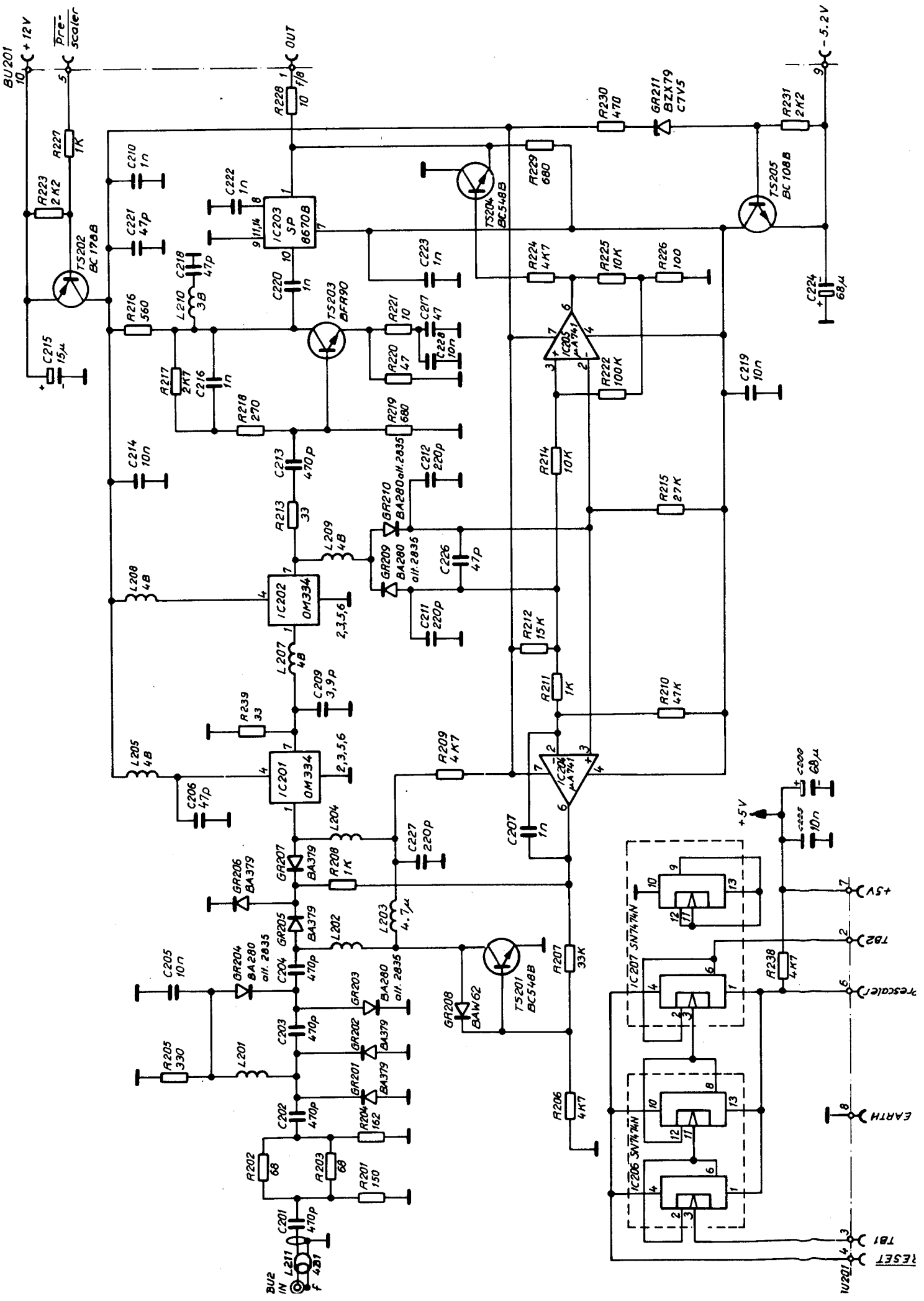
0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement (of transistor, resistor, etc.)
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

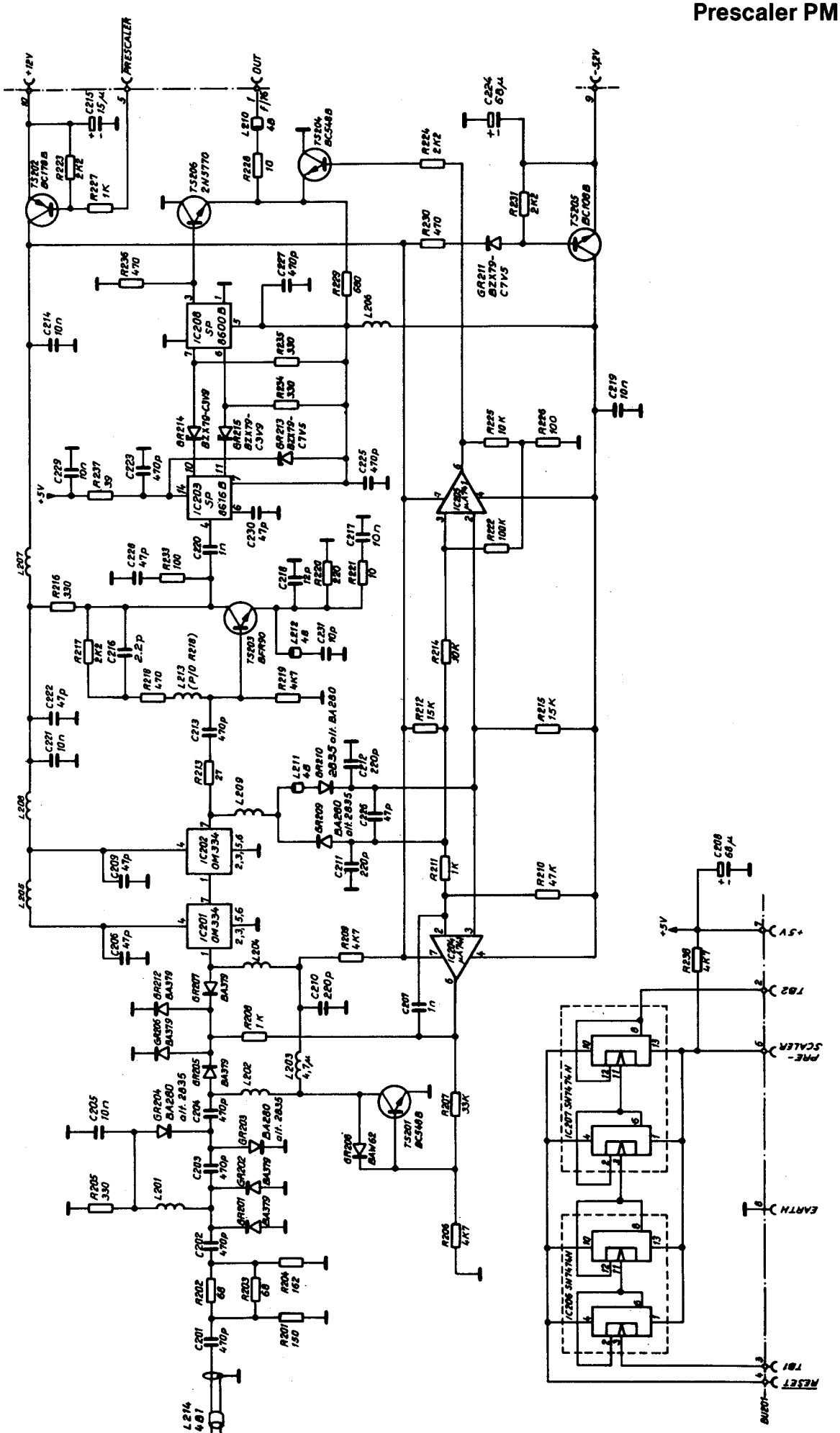
⑦ Job completed: Enter a cross when the job has been completed.

⑧ Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

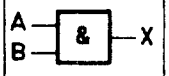
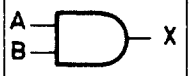
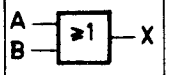
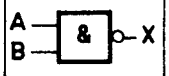
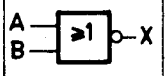
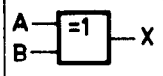
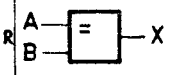
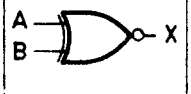
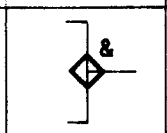
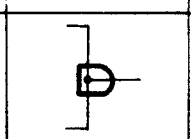
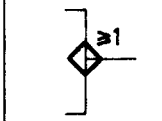
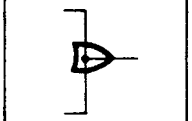
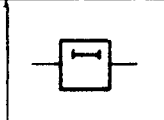
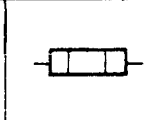
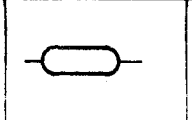
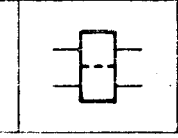
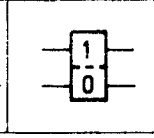
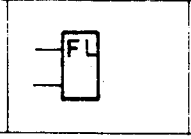
☐ ☐ 1 2 = 1,2 working hours (1 h 12 min.)

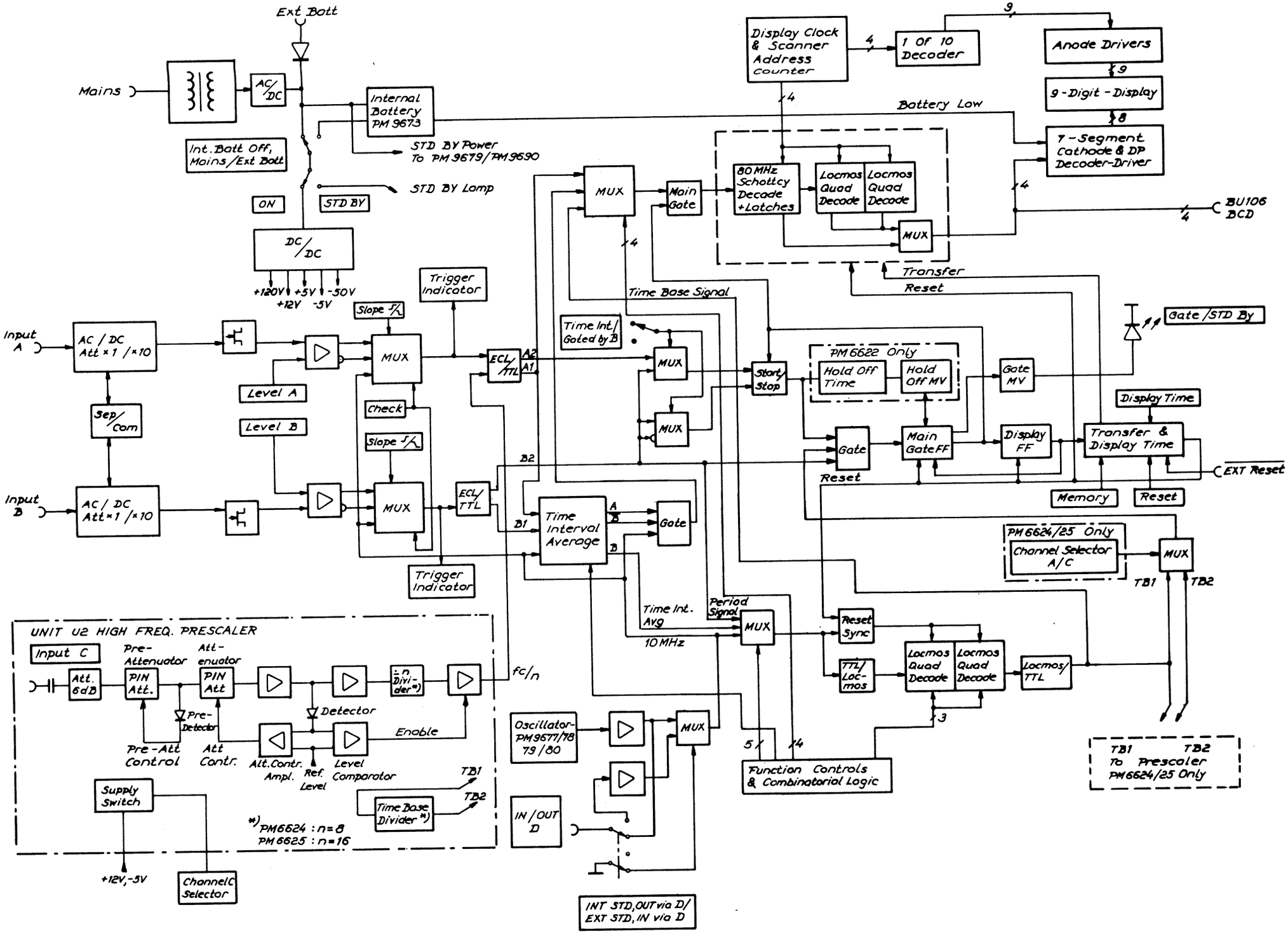
Prescaler PM 6624




+12V
PRESCALER
OUT
-12V
+5V
IC201 DM334
IC202 DM334
IC203 SP 8616 B
IC206 8600 B
IC207 SN74LN
IC208 SN74LN
T3201 BC178 B
T3202 BC178 B
T3203 BFR90
T3204 BC548 B
T3205 BC108 B
T3206 2N3710
T3207 BC548 B
GR201 BA379
GR202 BA379
GR203 BA280 a/l. 2835
GR204 BA280 a/l. 2835
GR205 BA379
GR206 BA379
GR207 BA379
GR208 BA379
GR209 BA280 a/l. 2835
GR210 2835 a/l. BA280
GR211 BZX79-C7V5
GR212 BA379
GR213 BZX79-C7V5
GR214 BZX79-C3V9
GR215 BZX79-C3V9
GR216 BAW62
PRE-SCALER
EARTH
RESET
TB1
TB2
BU1
BU2
IN

Standard symbols for logic elements

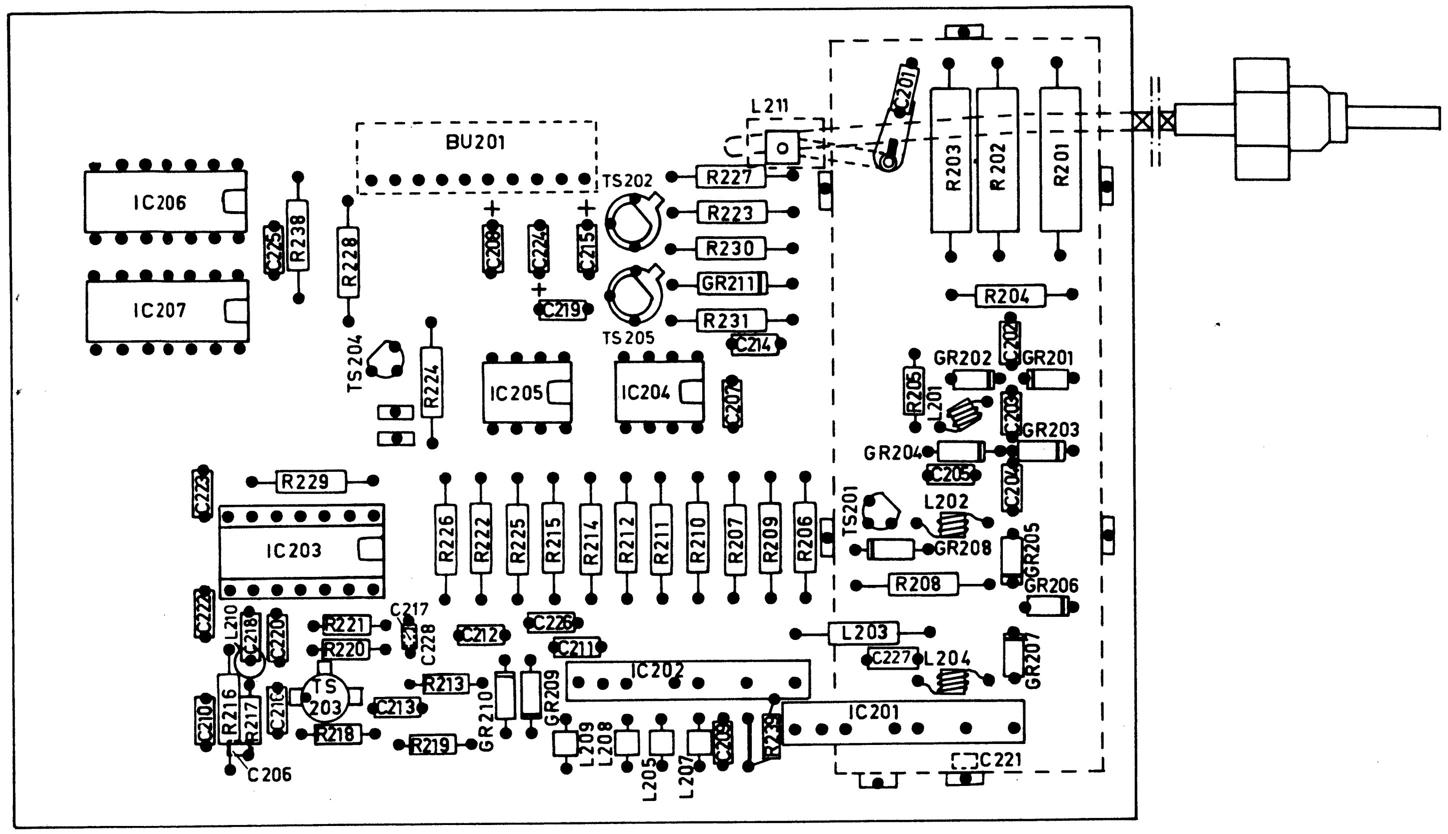
Circuit	I.E.C.	DIN norm 40700	American standard	Boolean function
AND				$X=AB$
OR				$X=A+B$
NAND				$X=\overline{AB}$
NOR				$X=\overline{A+B}$
NAND with one inverting input				$X=\overline{\overline{A}B}$
NOR with one inverting input				$X=\overline{\overline{A}+B}$
INHIBIT GATE				$X=(A+B)\overline{C}$
EXCLUSIVE OR				$X=A\overline{B}+\overline{A}B$
COMPARATOR				$X=AB+\overline{A}\,\overline{B}$
Distributed AND				
Distributed OR				
DELAY				
FLIP-FLOP				



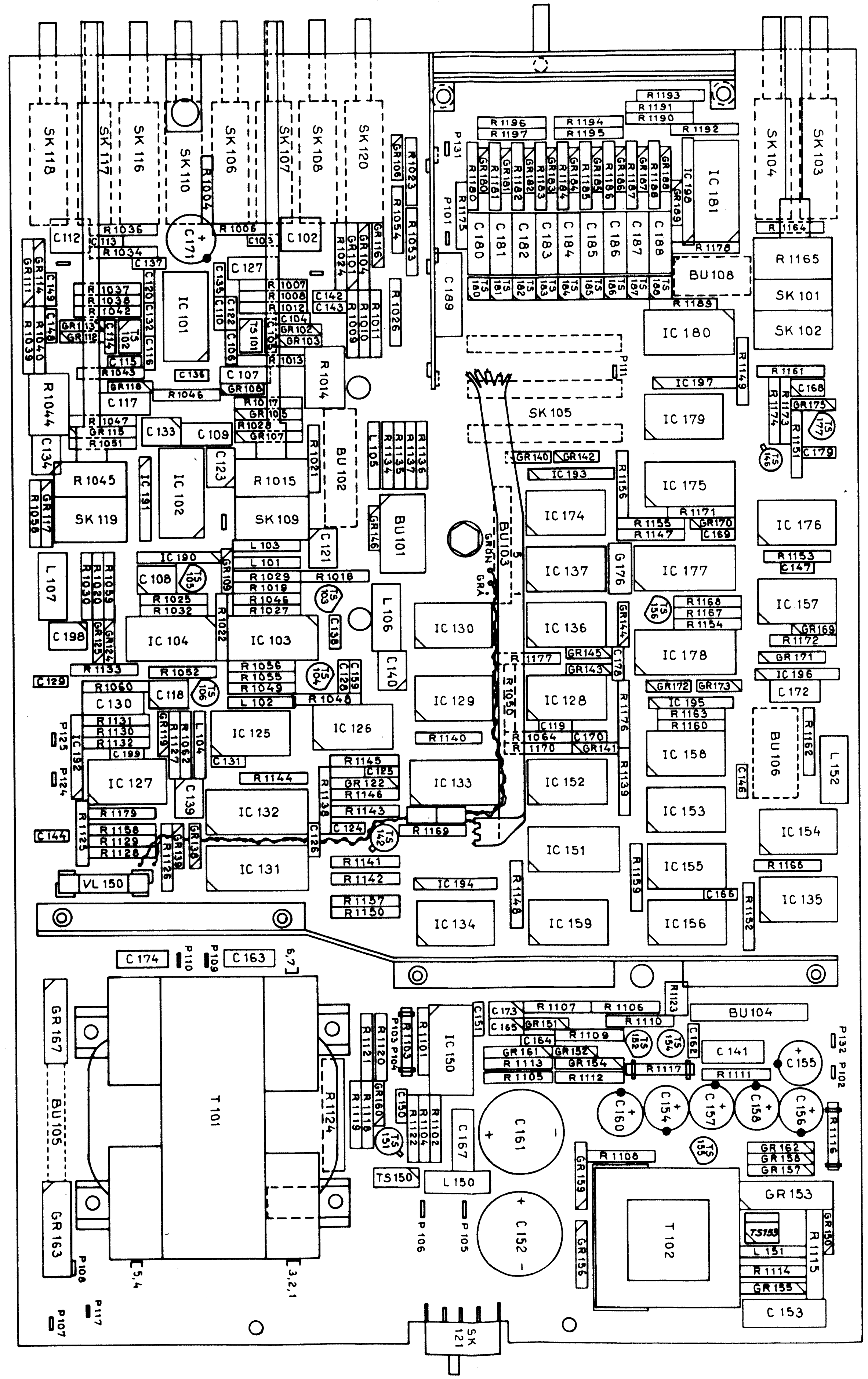
Block diagram

diagram

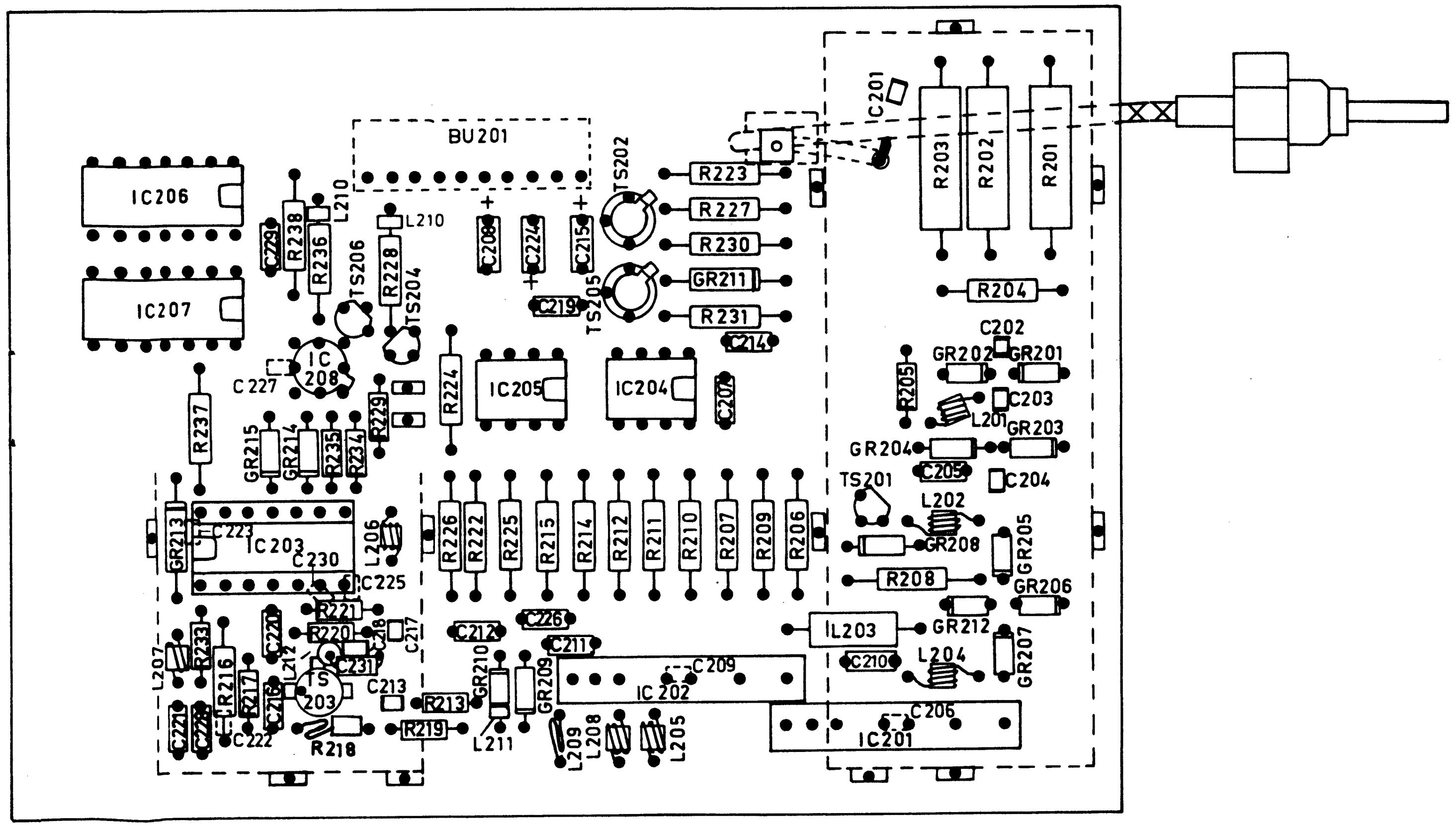
Prescaler PM 6624



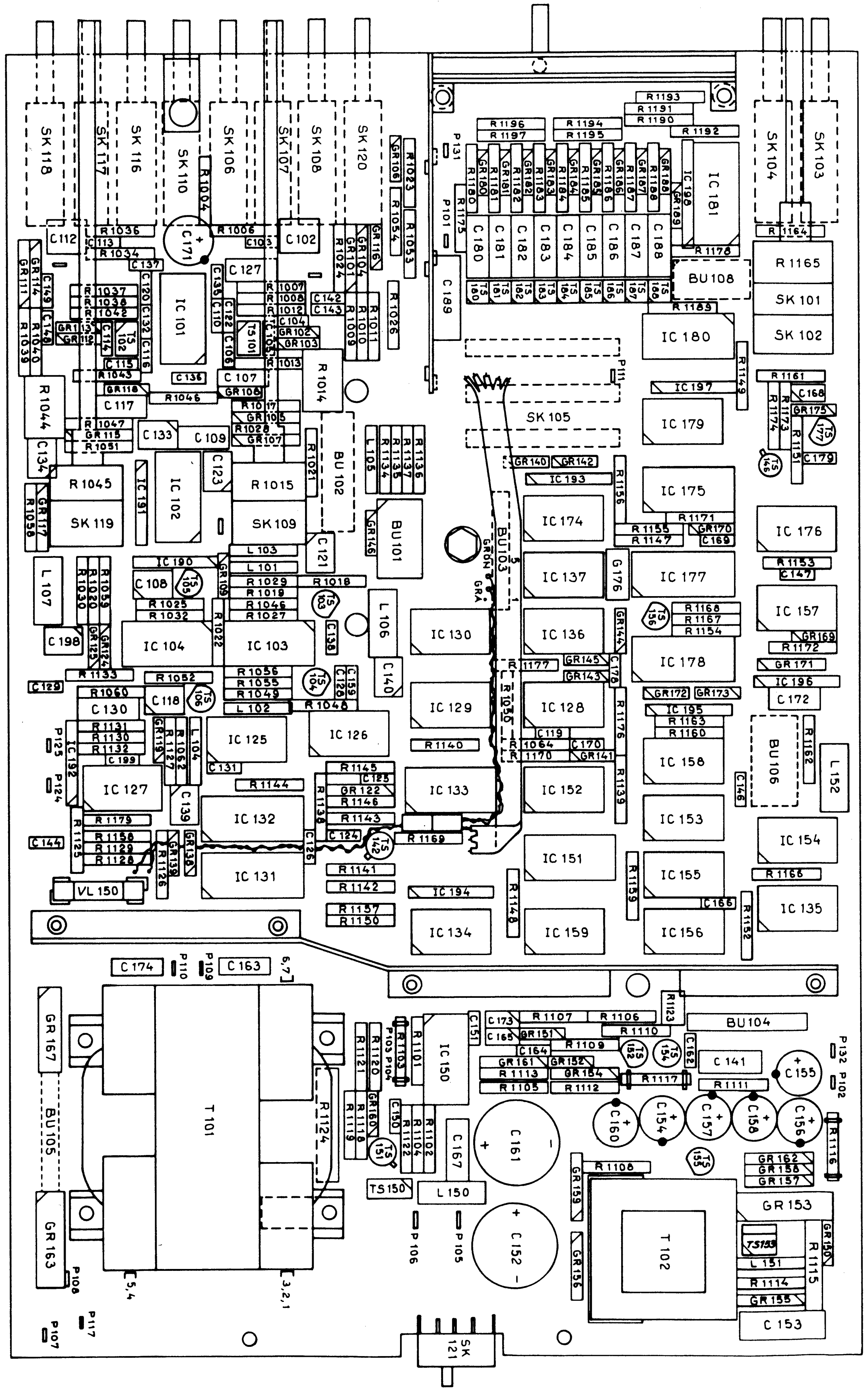
Basic board



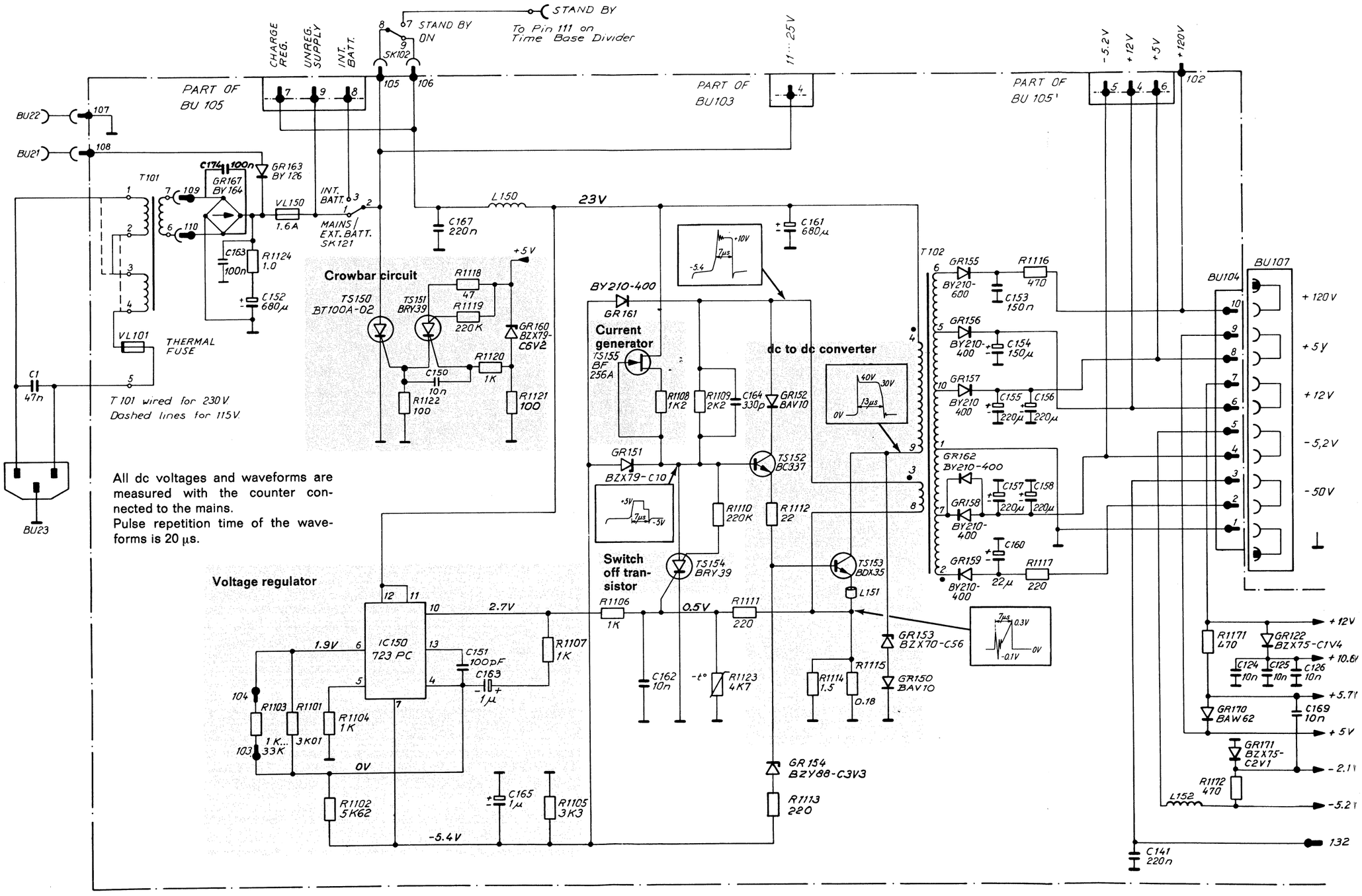
Prescaler PM 6625



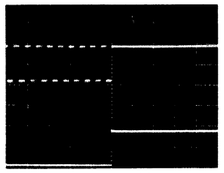
Basic board



SK 118
SK 117
SK 116
SK 110
SK 106
SK 107
SK 108
SK 120
SK 104
SK 103
IC 181
R 1165
SK 101
SK 102
BU 108
IC 180
C 189
C 180
C 181
C 182
C 183
C 184
C 185
C 186
C 187
C 188
IC 101
C 171
C 102
C 127
R 1014
R 1044
SK 105
IC 197
IC 179
BU 102
BU 101
BU 103
IC 193
IC 175
IC 176
R 1045
SK 119
IC 102
R 1015
SK 109
IC 174
IC 190
IC 137
IC 177
L 107
C 108
L 106
IC 130
IC 136
IC 157
C 198
IC 104
IC 103
IC 178
C 140
IC 196
C 172
C 130
C 118
IC 125
IC 126
IC 129
IC 128
IC 195
BU 106
IC 158
L 152
IC 127
IC 132
IC 133
IC 152
IC 153
IC 154
C 139
VL 150
IC 131
IC 151
IC 155
IC 194
IC 135
IC 134
IC 159
IC 156
C 174
C 163
BU 104
GR 167
T 101
BU 105
IC 150
C 141
C 155
C 160
C 154
C 157
C 158
C 156
C 161
C 167
L 150
TS 150
T 102
GR 153
C 152
GR 163
C 153
SK 121


CHARGE REG.
UNREG. SUPPLY
INT. BATT.
STAND BY ON
SK102
STAND BY
To Pin 111 on Time Base Divider
11 ... 25 V
-5.2 V
+12 V
+5 V
+120 V
PART OF BU 105
PART OF BU103
PART OF BU 105'
BU22
BU21
BU23
T101
C174 100n
GR167 BY164
GR163 BY126
VL150
1.6A
INT. BATT.
MAINS / EXT. BATT. SK121
L150
23V
C167 220n
C161 680µ
C163 100n
R1124 1.0
C152 680µ
VL101
THERMAL FUSE
C1 47n
T101 wired for 230V.
Dashed lines for 115V.
All dc voltages and waveforms are measured with the counter connected to the mains.
Pulse repetition time of the waveforms is 20 µs.
Crowbar circuit
TS150 BT100A-02
TS151 BRY39
R1118 47
R1119 220K
GR160 BZX79-C6V2
R1120 1K
C150 10n
R1122 100
R1121 100
+5V
BY210-400
GR161
Current generator
TS155 BF 256A
dc to dc converter
R1108 1K2
R1109 2K2
C164 330p
GR152 BAV10
GR151
BZX79-C10
TS152 BC337
R1110 220K
R1112 22
Switch off transistor
TS154 BRY39
TS153 BDX35
L151
Voltage regulator
IC150 723 PC
C151 100pF
C163 1µ
R1107 1K
R1103 1K...33K
R1101 3K01
R1104 1K
R1106 1K
R1111 220
R1123 4K7
C162 10n
R1114 1.5
0.18
R1115
GR150 BAV10
GR153 BZX70-C56
GR154 BZY88-C3V3
R1113 220
R1102 5K62
C165 1µ
R1105 3K3
2.7V
1.9V
0.5V
0V
-5.4V
T102
GR155 BY210-600
R1116 470
C153 150n
GR156 BY210-400
C154 150µ
GR157 BY210 400
C155 220µ
C156 220µ
GR162 BY210-400
GR158 BY210-400
C157 220µ
C158 220µ
GR159 BY210-400
C160
R1117 220
22µ
BU104
BU107
+120 V
+5 V
+12 V
-5,2 V
-50 V
R1171 470
GR122 BZX75-C1V4
+10.6 V
C124 10n
C125 10n
C126 10n
+5.7 V
GR170 BAW62
C169 10n
+5 V
GR171 BZX75-C2V1
-2.1 V
R1172 470
L152
-5.2 V
132
C141 220n

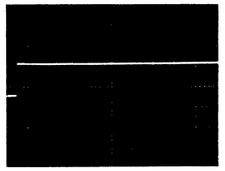
The waveforms are recorded with a 50 MHz 2 channels oscilloscope. The preliminary setting of the counter is minimum display time, Check mode and Frequency A 100 Hz. The rest of the controls is set to neutral position.



Inputsignal : 1 KHz

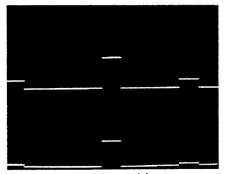
① 2 ms/div 2 V/div

IC 134 :5 2 ms/div 2 V/div



Frequency A 0.1 Hz

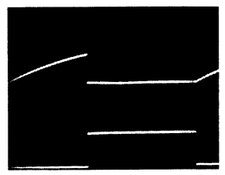
② 2 µs/div 5 V/div



Frequency A 10 Hz
Display : 10.00000

③ 0.2 ms/div 5 V/div

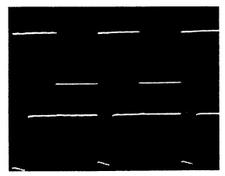
④ 0.2 ms/div 5 V/div



Single Period 0.1 ms
Hold off is on

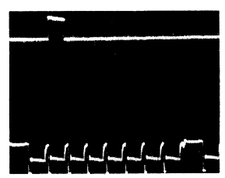
⑤ 0.5 ms/div 2 V/div

IC 134 :5 0.5 ms/div 2 V/div



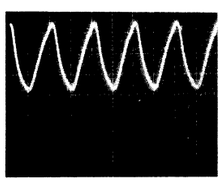
⑥ 50 µs/div 2 V/div

⑦ 50 µs/div 2 V/div

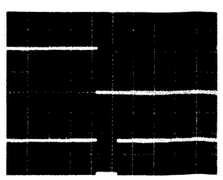


⑧ 0.2 ms/div 50 V/div

IC 181 :17 0.2 ms/div 50 V/div

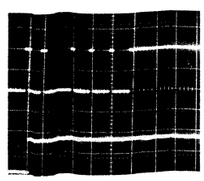


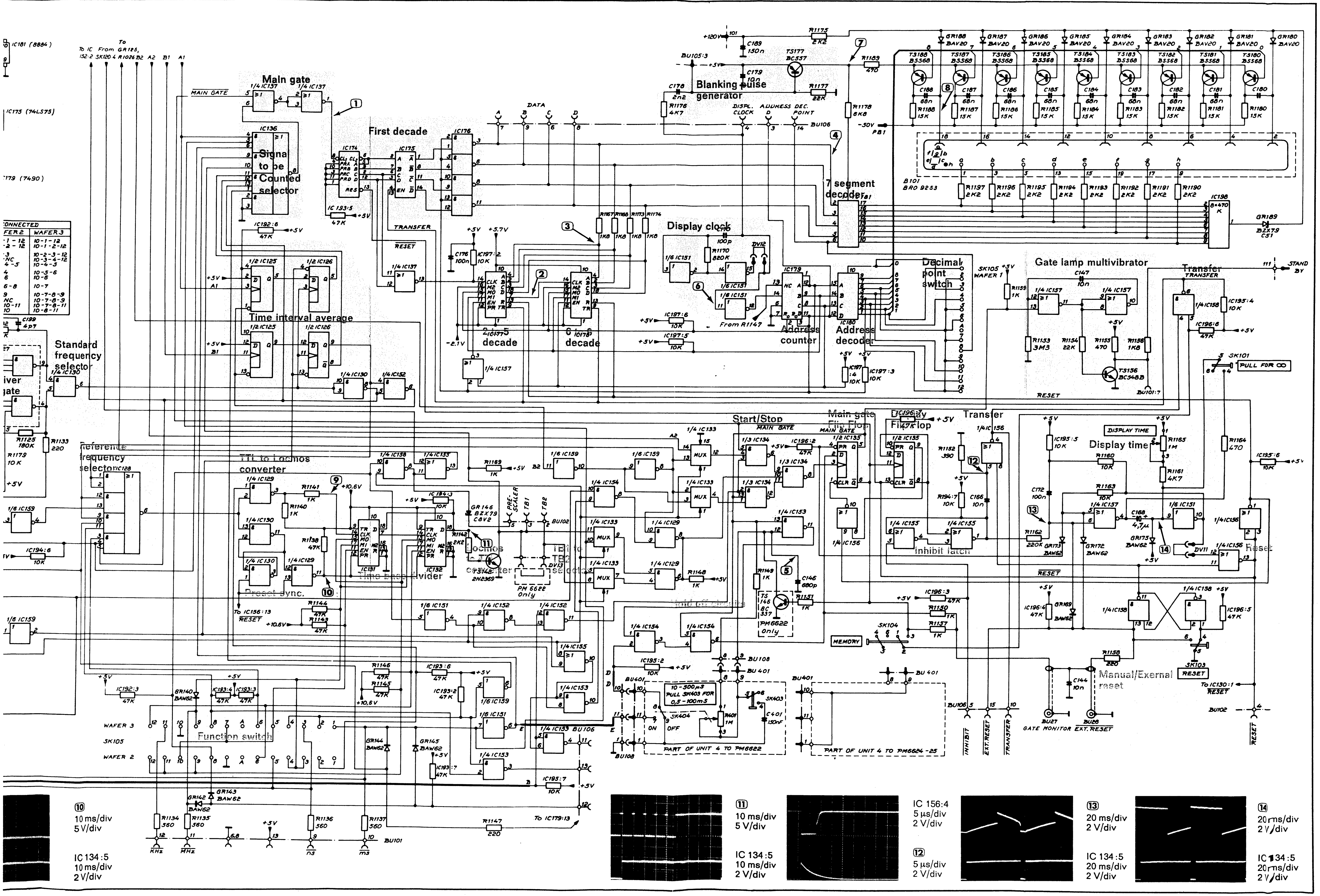
⑨ 50 ns/div 2 V/div



⑩ 10 ms/div 5 V/div

IC 134 :5 10 ms/div 2 V/div



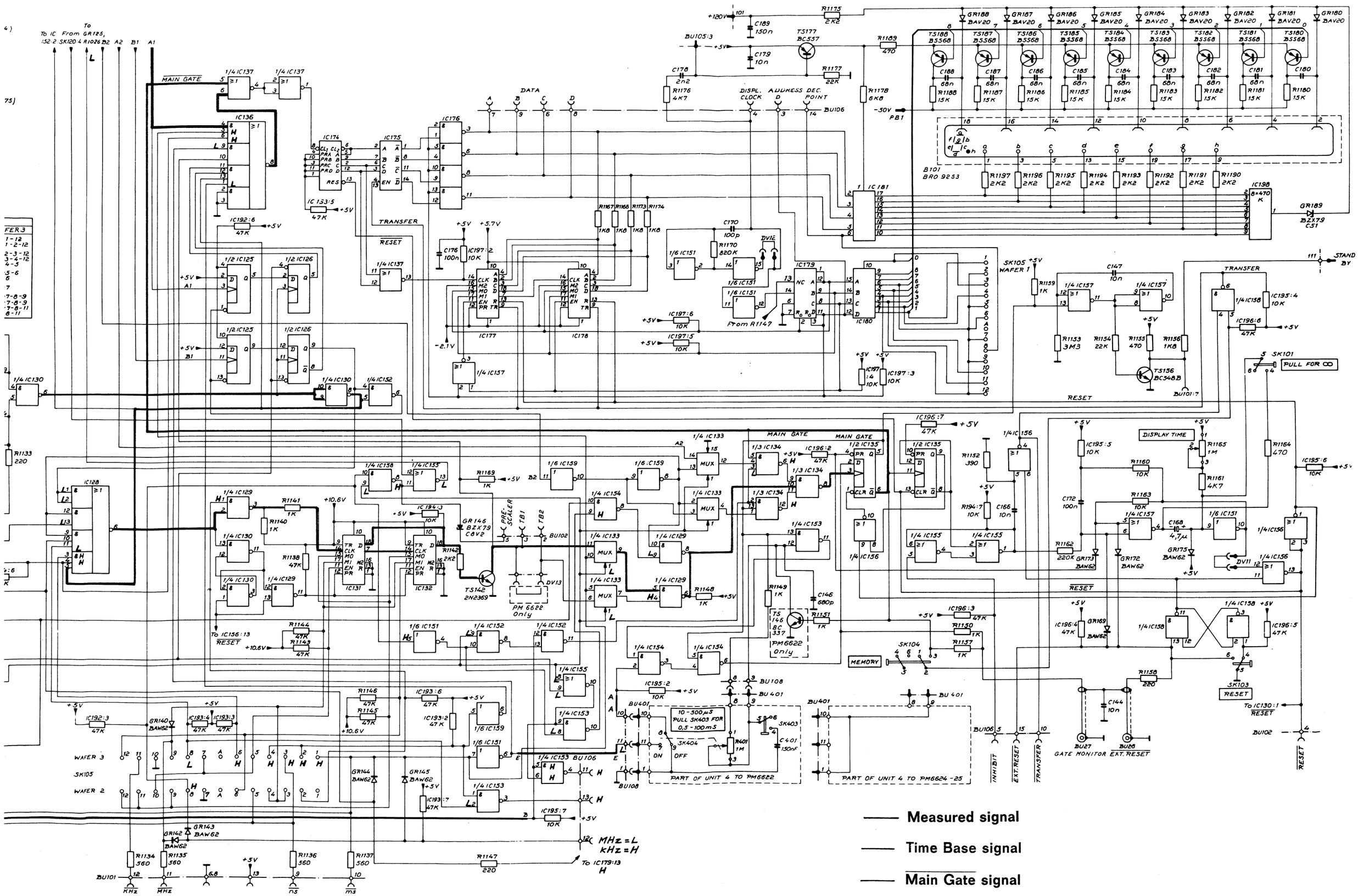

Main gate
Signal to be Counted selector
First decade
Blanking pulse generator
7 segment decoder
Display clock
Decimal point switch
Gate lamp multivibrator
Transfer
Time interval average
Standard frequency selector
Reference frequency selector
TTL to Locmos converter
2-5 decade
6 decade
Address counter
Address decoder
Start/Stop
Main gate Flip-flop
Display Flip-flop
Display time
Inhibit latch
Reset
Manual/Exernal reset
Time base divider
Locmos counter
Preset sync.
Function switch
PART OF UNIT 4 TO PM6622
PART OF UNIT 4 TO PM6624-25
GATE MONITOR
EXT.RESET
PULL FOR ∞
MEMORY
RESET
10 ms/div
5 V/div
IC 134:5
10 ms/div
2 V/div
10 ms/div
5 V/div
IC 134:5
10 ms/div
2 V/div
IC 156:4
5 µs/div
2 V/div
5 µs/div
2 V/div
20 ms/div
2 V/div
IC 134:5
20 ms/div
2 V/div
20 ms/div
2 V/div
IC 134:5
20 ms/div
2 V/div

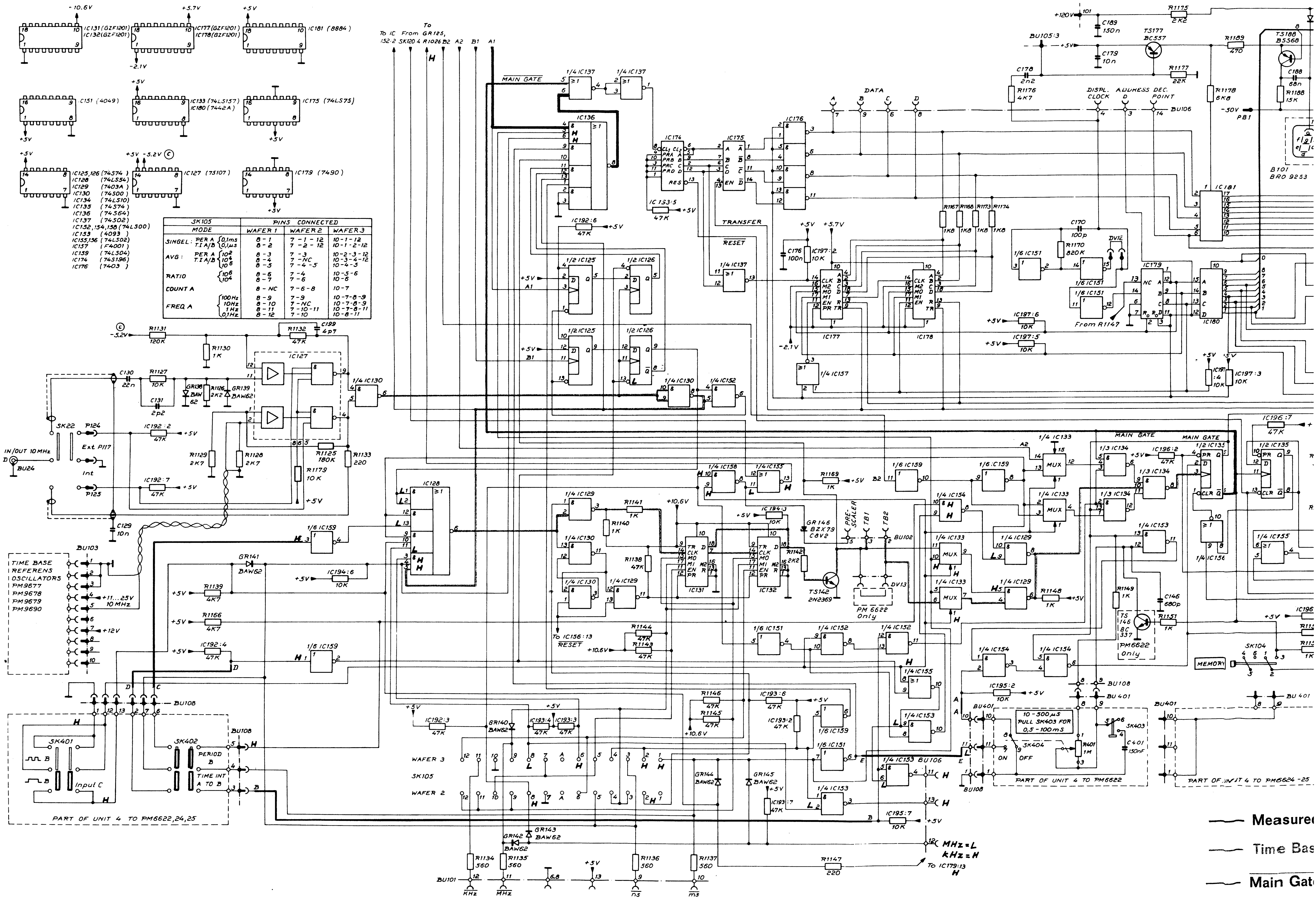
SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A 0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
	T.I A/B 0,1µs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG:	PER A 10^5	8 - 3	7 - 3	10 - 2 - 3 - 12
	T.I A/B 10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^3	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100 Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10 Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1 Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1 Hz	8 - 12	7 - 10	10 - 8 - 11

— Measured

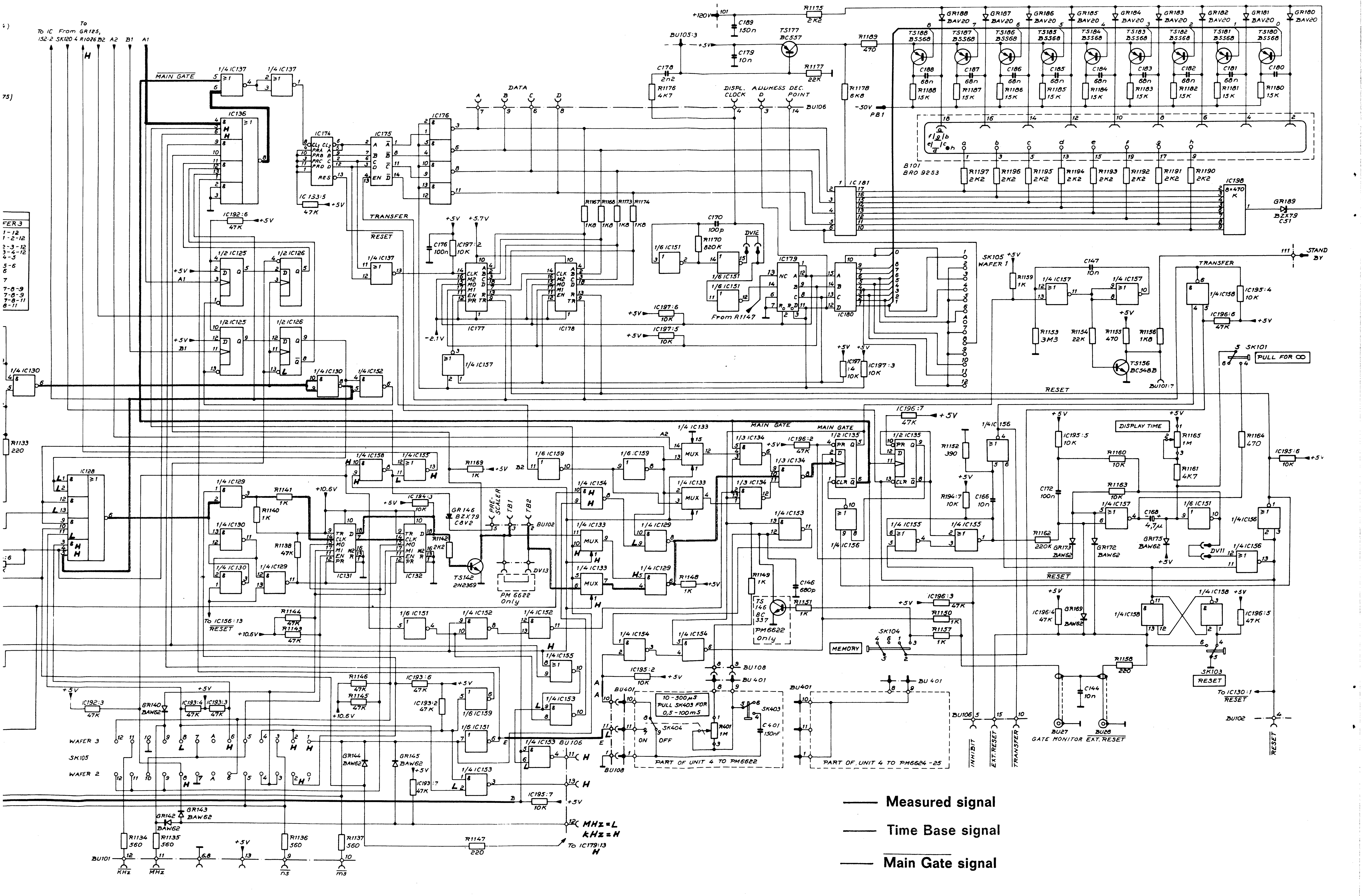
— Time Base

— Main Gate


MAIN GATE
TRANSFER
RESET
DATA
DISPL. CLOCK
ADDRESS DEC.
POINT
DISPLAY TIME
MEMORY
STAND BY
PULL FOR ∞
PART OF UNIT 4 TO PM6622
PART OF UNIT 4 TO PM6624-25
GATE MONITOR
EXT. RESET
INHIBIT
EXT. RESET
TRANSFER
WAFER 3
WAFER 2
SK105
MHz = L
kHz = H
Measured signal
Time Base signal
Main Gate signal



SK105	PINS CONNECTED		
MODE	WAFER 1	WAFER 2	WAFER 3
SINGEL: PER A 0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
SINGEL: T.I A/B 0,1μs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG: PER A / T.I A/B 10^2	8 - 3	7 - 3	10 - 2 - 3 - 12
AVG: 10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
AVG: 10^6	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO 10^6	8 - 6	7 - 4	10 - 5 - 6
RATIO 10^4	8 - 7	7 - 6	10 - 6
COUNT A	8 - NC	7 - 6 - 8	10 - 7
FREQ A 100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
FREQ A 10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
FREQ A 1Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
FREQ A 0,1Hz	8 - 12	7 - 10	10 - 8 - 11


Measured signal
Time Base signal
Main Gate signal

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A	8 - 1	7 - 1 - 12	10 - 1 - 12
	T.I A/B 0,1ms	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
	T.I A/B 0,1µs			
AVG:	PER A 10^2	8 - 3	7 - 3	10 - 2 - 3 - 12
	T.I A/B 10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^6	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100 Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10 Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1 Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1 Hz	8 - 12	7 - 10	10 - 8 - 11

IC131 (GZF1201)
IC132 (GZF1201)
IC177 (GZF1201)
IC178 (GZF1201)
IC181 (8884)
IC151 (4049)
IC133 (74LS157)
IC180 (7442A)
IC175 (74LS75)
IC125,126 (74S74)
IC128 (74LS54)
IC129 (7403A)
IC130 (74S00)
IC134 (74LS10)
IC135 (74S74)
IC136 (74S64)
IC137 (74S02)
IC152,154,156 (74LS00)
IC133 (4093)
IC155,156 (74LS02)
IC157 (F4001)
IC159 (74LS04)
IC174 (74S196)
IC176 (7403)
IC127 (75107)
IC179 (7490)

Measure
Time ba
Main ga

MAIN GATE
TRANSFER
RESET
DATA
DISPL. CLOCK
ADDRESS DEC. POINT
STAND BY
PULL FOR ∞
MEMORY
DISPLAY TIME
GATE MONITOR
INHIBIT
EXT. RESET
TRANSFER
WAFER 1
WAFER 2
WAFER 3
SK105
PART OF UNIT 4 TO PM6622
PART OF UNIT 4 TO PM6624 -25
PM 6622 Only
PRE-SCALER
10 - 300 µS PULL SK403 FOR 0,5 - 100 mS
ON
OFF
KHz
MHz
ns
ms

Measured signal
Time base
Main gate signal

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A 0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
	T.I A/B 0,1µs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG:	PER A 10^4	8 - 3	7 - 3	10 - 2 - 3 - 12
	T.I A/B 10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^5	8 - 3	7 - 4 - 5	10 - 4 - 5
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1Hz	8 - 12	7 - 10	10 - 8 - 11

IC125,126 (74S74)
IC128 (74LS54)
IC129 (7403A)
IC130 (74S00)
IC134 (74LS10)
IC135 (74S74)
IC136 (74S64)
IC137 (74S02)
IC152, 154, 158 (74L300)
IC153 (4093)
IC155,156 (74LS02)
IC157 (F4001)
IC139 (74LS04)
IC174 (74S196)
IC176 (7403)

MAIN GATE
TRANSFER
RESET
DATA
DISPL. CLOCK
ADDRESS DEC.
POINT
WAFER 3
WAFER 2
SK105
MEMORY
DISPLAY TIME
STAND BY
PULL FOR ∞
GATE MONITOR EXT. RESET
INHIBIT
EXT. RESET
TRANSFER
PART OF UNIT 4 TO PM6622
PART OF UNIT 4 TO PM6624-25
PM 6622 Only

— Measured signal

— 10 MHz Internal Standard

— Main Gate signal

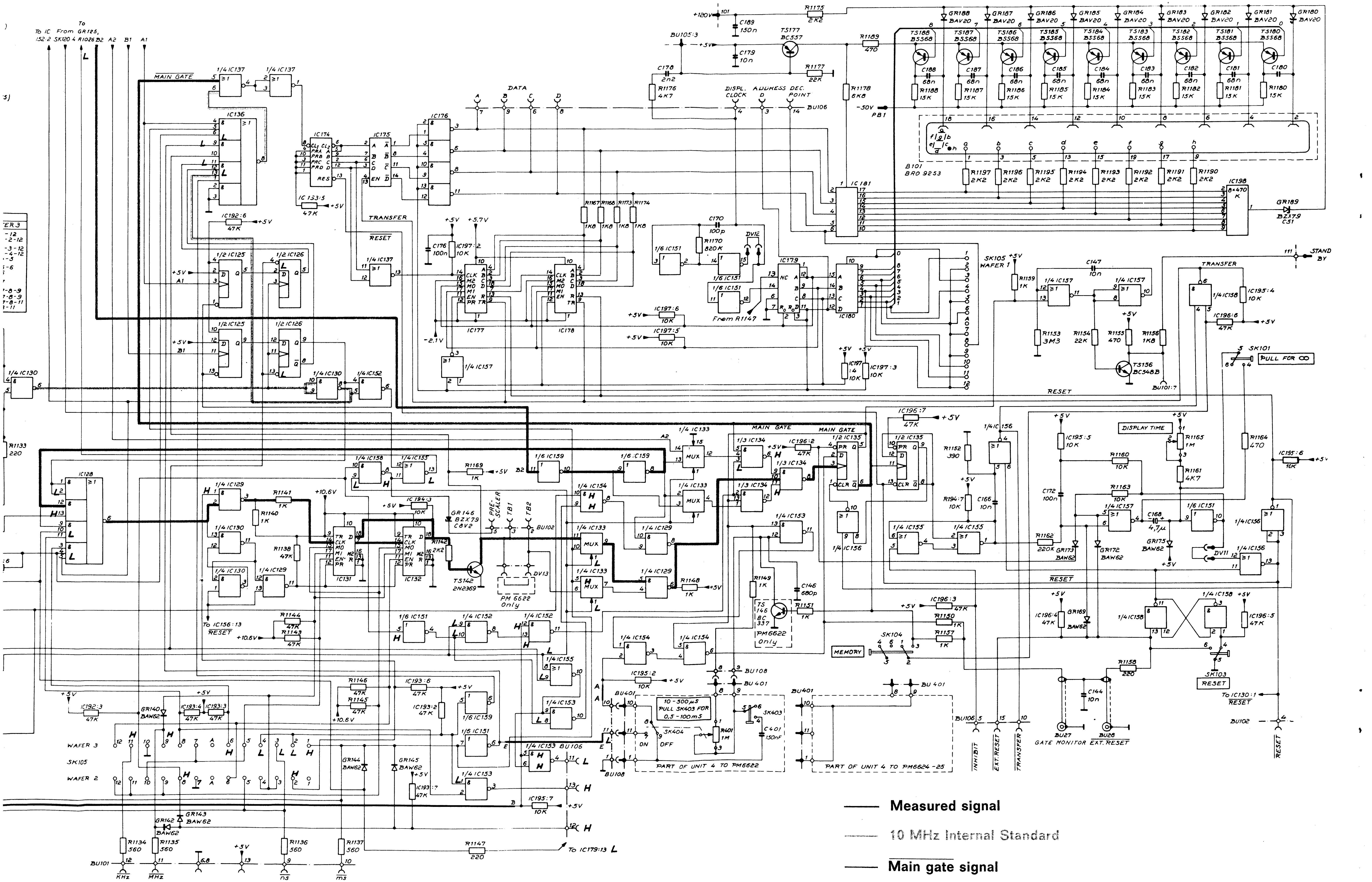
SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A 0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
	T.I A/B 0,1µs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG:	PER A 10^2	8 - 3	7 - 3	10 - 2 - 3 - 12
	T.I A/B 10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^6	8 - 5	7 - 4 - 5	10 - 4 - 3
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100 Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10 Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1 Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1 Hz	8 - 12	7 - 10	10 - 8 - 11

Measured

10 MHz Int

Main gate

Period average



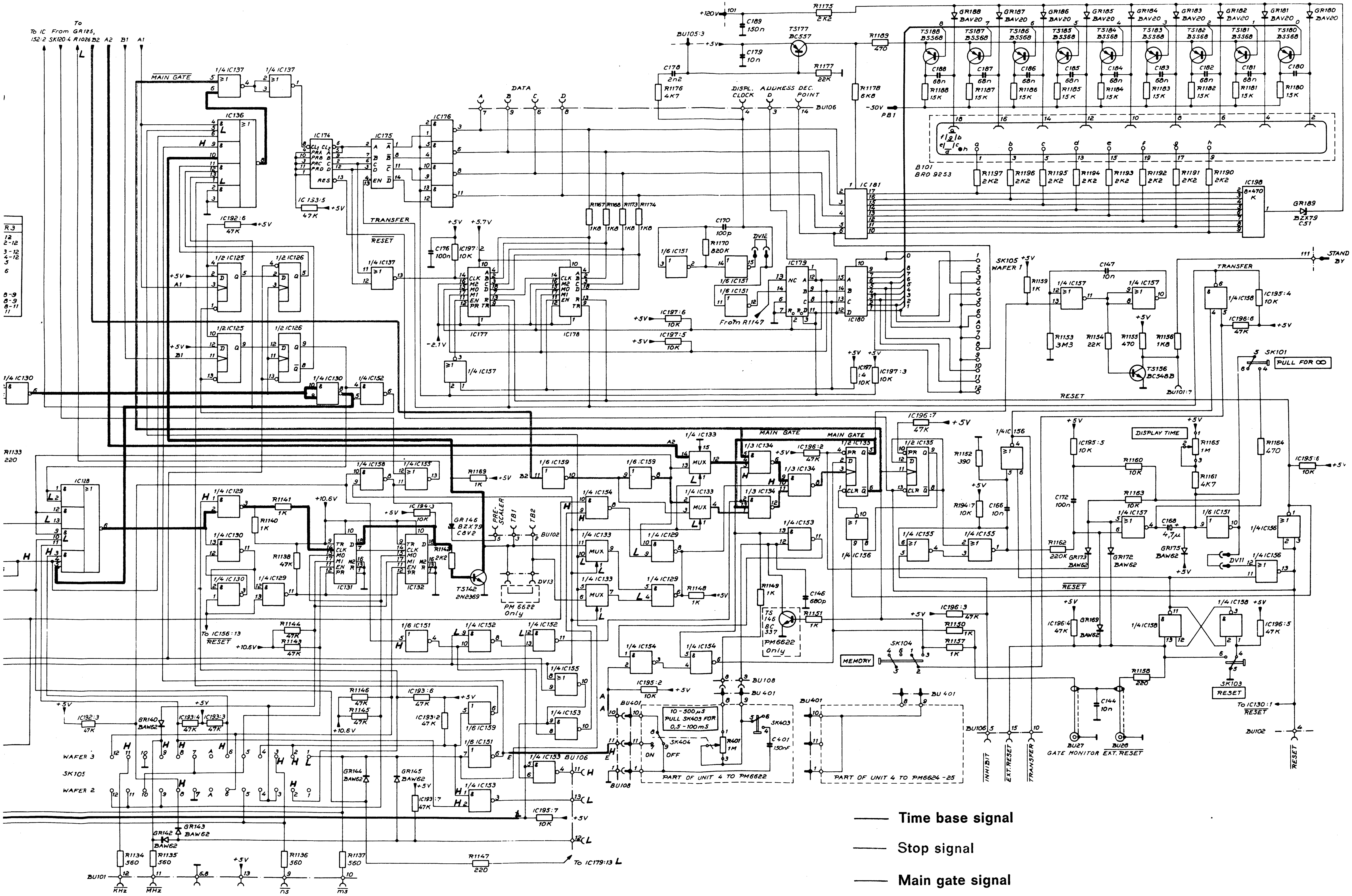
— Measured signal

---- 10 MHz Internal Standard

— Main gate signal

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A	0,1ms	8 - 1	7 - 1 - 12	10-1-12
	T.I A/B	0,1µs	8 - 2	7 - 2 - 12	10-1-2-12
AVG:	PER A	10^2	8 - 3	7 - 3	10-2-3-12
	T.I A/B	10^3	8 - 4	7 - NC	10-3-4-12
		10^4	8 - 5	7 - 4 - 5	10-4-5
RATIO		10^5	8 - 6	7 - 4	10 -5-6
		10^6	8 - 7	7 - 6	10-6
COUNT A			8 - NC	7 - 6 - 8	10-7
FREQ A		100Hz	8 - 9	7 - 9	10-7-8-9
		10Hz	8 - 10	7 - NC	10-7-8-9
		1Hz	8 - 11	7 - 10 - 11	10-7-8-11
		0,1Hz	8 - 12	7 - 10	10-8-11

Time base s
Stop signal
Main gate si
Start signal



Time base signal

Stop signal

Main gate signal

Start signal

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A 0,1ms	8 - 1	7 - 1 - 12	10-1-12
	T.I A/B 0,1µs	8 - 2	7 - 2 - 12	10-1-2-12
AVG:	PER A 10^2	8 - 3	7 - 3	10-2-3-12
	T.I A/B 10^4	8 - 4	7 - NC	10-3-4-12
	10^6	8 - 5	7 - 4 - 5	10-4-5
RATIO	10^6	8 - 6	7 - 4	10-5-6
	10^4	8 - 7	7 - 6	10-6
COUNT A		8 - NC	7-6-8	10-7
FREQ A	100Hz	8 - 9	7-9	10-7-8-9
	10Hz	8 - 10	7 - NC	10-7-8-9
	1Hz	8 - 11	7 - 10-11	10-7-8-11
	0,1Hz	8 - 12	7 - 10	10-8-11

IC125,126 (74S74)
IC128 (74LS54)
IC129 (7403A)
IC130 (74S00)
IC134 (74LS10)
IC135 (74S74)
IC136 (74S64)
IC137 (74S02)
IC152,154,158 (74LS00)
IC153 (4093)
IC155,156 (74LS02)
IC157 (F4001)
IC159 (74LS04)
IC174 (74S196)
IC176 (7403)

- Start signal
- Stop signal
- Main gate s
- 10 MHz Inte

Time Interval 0.1 µs

— Start signal

— Stop signal

— Main gate signal

— 10 MHz Internal Standard

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL:	PER A	8 - 1	7 - 1 - 12	10 - 1 - 12
	T.I A/B 0,1ms	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
	0,1µs			
AVG:	PER A 10²	8 - 3	7 - 3	10 - 2 - 3 - 12
	T.I A/B 10³	8 - 4	7 - NC	10 - 3 - 4 - 12
	10⁴	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO	10⁶	8 - 6	7 - 4	10 - 5 - 6
	10⁴	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1 Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1Hz	8 - 12	7 - 10	10 - 8 - 11

IC131 (GZF1201) IC132 (GZF1201) IC177 (GZF1201) IC178 (GZF1201) IC181 (8884)
IC151 (4049) IC133 (74LS157) IC180 (7442A) IC175 (74LS75)
IC125,126 (74S74) IC128 (74LS54) IC129 (7403A) IC130 (74S00) IC134 (74LS10) IC135 (74S74) IC136 (74S64) IC137 (74S02) IC152,154,158 (74LS00) IC153 (4093) IC155,156 (74LS02) IC157 (F4001) IC139 (74LS04) IC174 (74S196) IC176 (7403)
IC127 (75107) IC179 (7490)

TIME BASE REFERENS OSCILLATORS PM9677 PM9678 PM9679 PM9690

PART OF UNIT 4 TO PM6622,24,25

PART OF UNIT 4 TO PM6622

PART OF UNIT 4 TO PM6624 -25

Start sign
Stop sign
Main gate
10 MHz li

Time Interval average A to B

— Start signal

— Stop signal

— $\overline{\text{Main gate signal}}$

— 10 MHz Internal Standard

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL: PER A T.I A/B	0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
	0,1µs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG: PER A T.I A/B	10^2	8 - 3	7 - 3	10 - 2 - 3 - 12
	10^4	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^6	8 - 5	7 - 4 - 5	10 - 4 - 3
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1Hz	8 - 12	7 - 10	10 - 8 - 11

IC131 (GZF1201)
IC132 (GZF1201)
IC177 (GZF1201)
IC178 (GZF1201)
IC181 (8884)
IC151 (4049)
IC133 (74LS157)
IC180 (7442A)
IC175 (74LS75)
IC125,126 (74S74)
IC128 (74LS54)
IC129 (7403A)
IC130 (74S00)
IC134 (74LS10)
IC135 (74S74)
IC136 (74S64)
IC137 (74S02)
IC132,154,158 (74LS00)
IC139 (4093)
IC155,156 (74LS02)
IC157 (F4001)
IC159 (74LS04)
IC174 (74S196)
IC176 (7403)
IC127 (75107)
IC179 (7490)

TIME BASE REFERENS OSCILLATORS
PM9677
PM9678
PM9679
PM9690

PART OF UNIT 4 TO PM6622,24,25

PART OF UNIT 4 TO PM6622

PART OF UNIT 4 TO PM6624 -25

A1 Measur
B2 Measur
Main gate

— A1 Measured signal

— B2 Measured signal

— $\overline{\text{Main gate}}$ signal

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL: PER A	0,1ms	8 - 1	7 - 1 - 12	10-1-12
T.I A/B	0,1µs	8 - 2	7 - 2 - 12	10-1-2-12
AVG: PER A	10^2	8 - 3	7 - 3	10-2-3-12
T.I A/B	10^4	8 - 4	7 - NC	10-3-4-12
	10^6	8 - 5	7 - 4 - 5	10-4-5
RATIO	10^6	8 - 6	7 - 4	10-5-6
	10^4	8 - 7	7 - 6	10-6
COUNT A		8 - NC	7-6-8	10-7
FREQ A	100Hz	8 - 9	7 - 9	10-7-8-9
	10Hz	8 - 10	7 - NC	10-7-8-9
	1Hz	8 - 11	7 - 10-11	10-7-8-11
	0,1Hz	8 - 12	7 - 10	10-8-11

IC131 (GZF1201)
IC132 (GZF1201)
IC177 (GZF1201)
IC178 (GZF1201)
IC181 (8884)
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IC133 (74LS157)
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IC125,126 (74S74)
IC128 (74LS54)
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IC130 (74S00)
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IC152,154,158 (74LS00)
IC153 (4093)
IC155,156 (74LS02)
IC157 (F4001)
IC159 (74LS04)
IC174 (74S196)
IC176 (7403)
IC127 (75107)
IC179 (7490)

TIME BASE REFERENS OSCILLATORS
PM9677
PM9678
PM9679
PM9690
+11...25V 10MHz
+12V

PART OF UNIT 4 TO PM6622,24,25

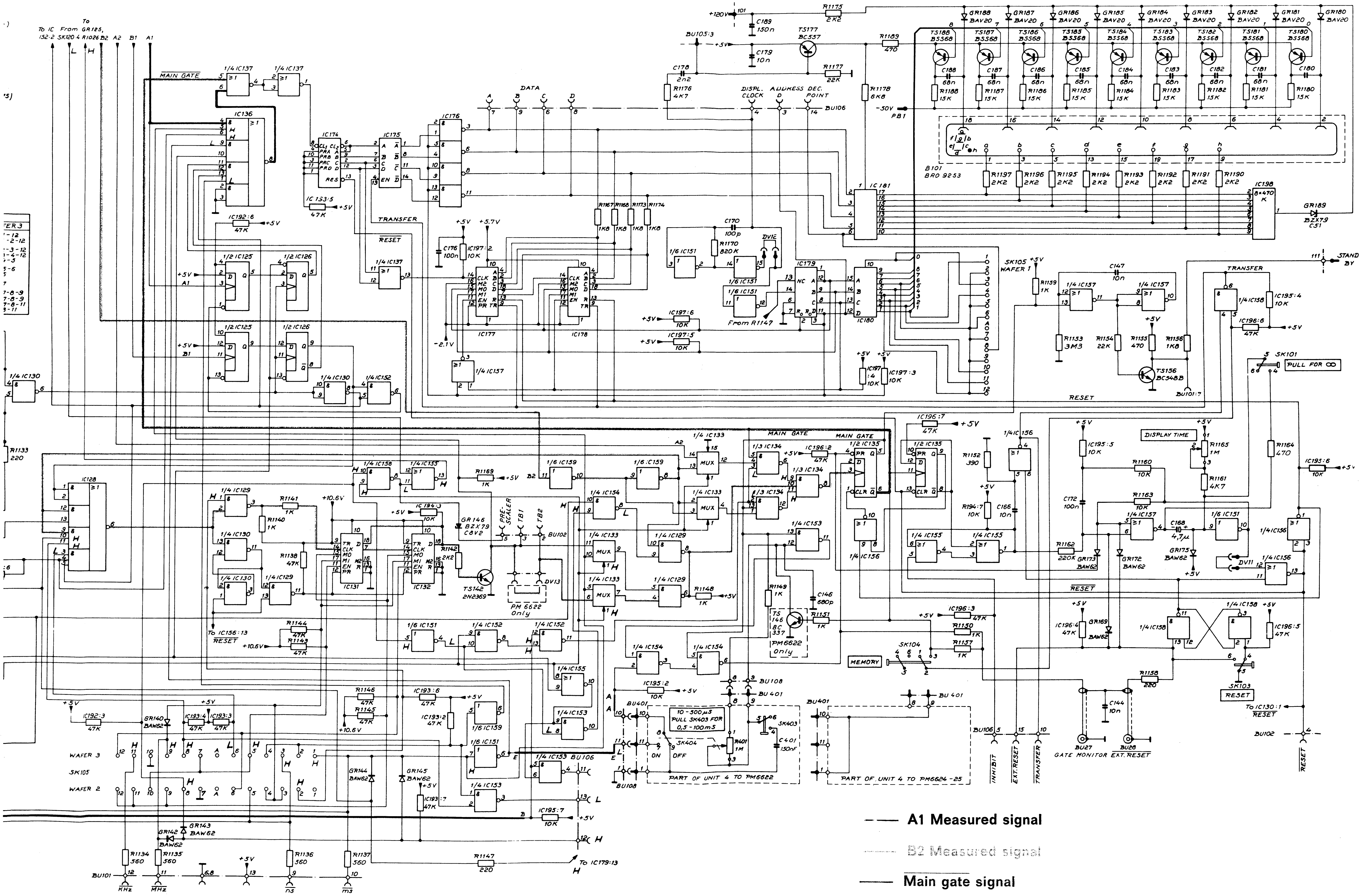
PART OF UNIT 4 TO PM6622

PART OF UNIT 4 TO PM6624 -25

PM 6622 Only

WAFER 3
SK105
WAFER 2

A1 Measur
B2 Measur
Main gate s



— — A1 Measured signal

······ B2 Measured signal

—— Main gate signal

SK105 MODE		PINS CONNECTED WAFER 1	WAFER 2	WAFER 3
SINGEL: PER A T.I A/B	0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
	0,1µs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG: PER A T.I A/B	10^4	8 - 3	7 - 3	10 - 2 - 3 - 12
	10^5	8 - 4	7 - NC	10 - 3 - 4 - 12
	10^6	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO	10^6	8 - 6	7 - 4	10 - 5 - 6
	10^4	8 - 7	7 - 6	10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1Hz	8 - 12	7 - 10	10 - 8 - 11

Measured

Start/Stop

Main gate

Count A Start/Stop by B

To IC From GR125, 152-2 SK120 4 R1026 B2 A2 B1 A1

MAIN GATE

TRANSFER

RESET

DATA

DISPL. CLOCK ADDRESS D DEC. POINT

BU105 3

BU106

BU101 BRO 9253

-30V PB1

+120V

+5V

-2.7V

+10.6V

GR188 BAV20 GR187 BAV20 GR186 BAV20 GR185 BAV20 GR184 BAV20 GR183 BAV20 GR182 BAV20 GR181 BAV20 GR180 BAV20

TS188 BS568 TS187 BS568 TS186 BS568 TS185 BS568 TS184 BS568 TS183 BS568 TS182 BS568 TS181 BS568 TS180 BS568

GR189 BZX79 C51

SK105 WAFER 1

SK104 MEMORY

SK101 PULL FOR ∞

SK103 RESET

SK105 WAFER 2

SK105 WAFER 3

STAND BY

DISPLAY TIME

PART OF UNIT 4 TO PM6622

PART OF UNIT 4 TO PM6624-25

PM 6622 Only

10 - 500 µS PULL SK403 FOR 0,5 - 100 mS

ON OFF

INH BIT EXT. RESET TRANSFER GATE MONITOR BU27 EXT. RESET BU28

KHz MHz ns ms

To IC179:13 H

To IC156:13 RESET

To IC130:1 RESET

Measured signal

Start/Stop signal

Main gate signal

SK105		PINS CONNECTED		
MODE		WAFER 1	WAFER 2	WAFER 3
SINGEL : PER A T.I A/B	0,1ms	8 - 1	7 - 1 - 12	10 - 1 - 12
	0,1µs	8 - 2	7 - 2 - 12	10 - 1 - 2 - 12
AVG : PER A T.I A/B	10²	8 - 3	7 - 3	10 - 2 - 3 - 12
	10⁴	8 - 4	7 - NC	10 - 3 - 4 - 12
	10⁶	8 - 5	7 - 4 - 5	10 - 4 - 5
RATIO	10⁶/10⁴	8 - 6 / 8 - 7	7 - 4 / 7 - 6	10 - 5 - 6 / 10 - 6
COUNT A		8 - NC	7 - 6 - 8	10 - 7
FREQ A	100Hz	8 - 9	7 - 9	10 - 7 - 8 - 9
	10Hz	8 - 10	7 - NC	10 - 7 - 8 - 9
	1Hz	8 - 11	7 - 10 - 11	10 - 7 - 8 - 11
	0,1Hz	8 - 12	7 - 10	10 - 8 - 11

Measured

Gate signa

Main gate

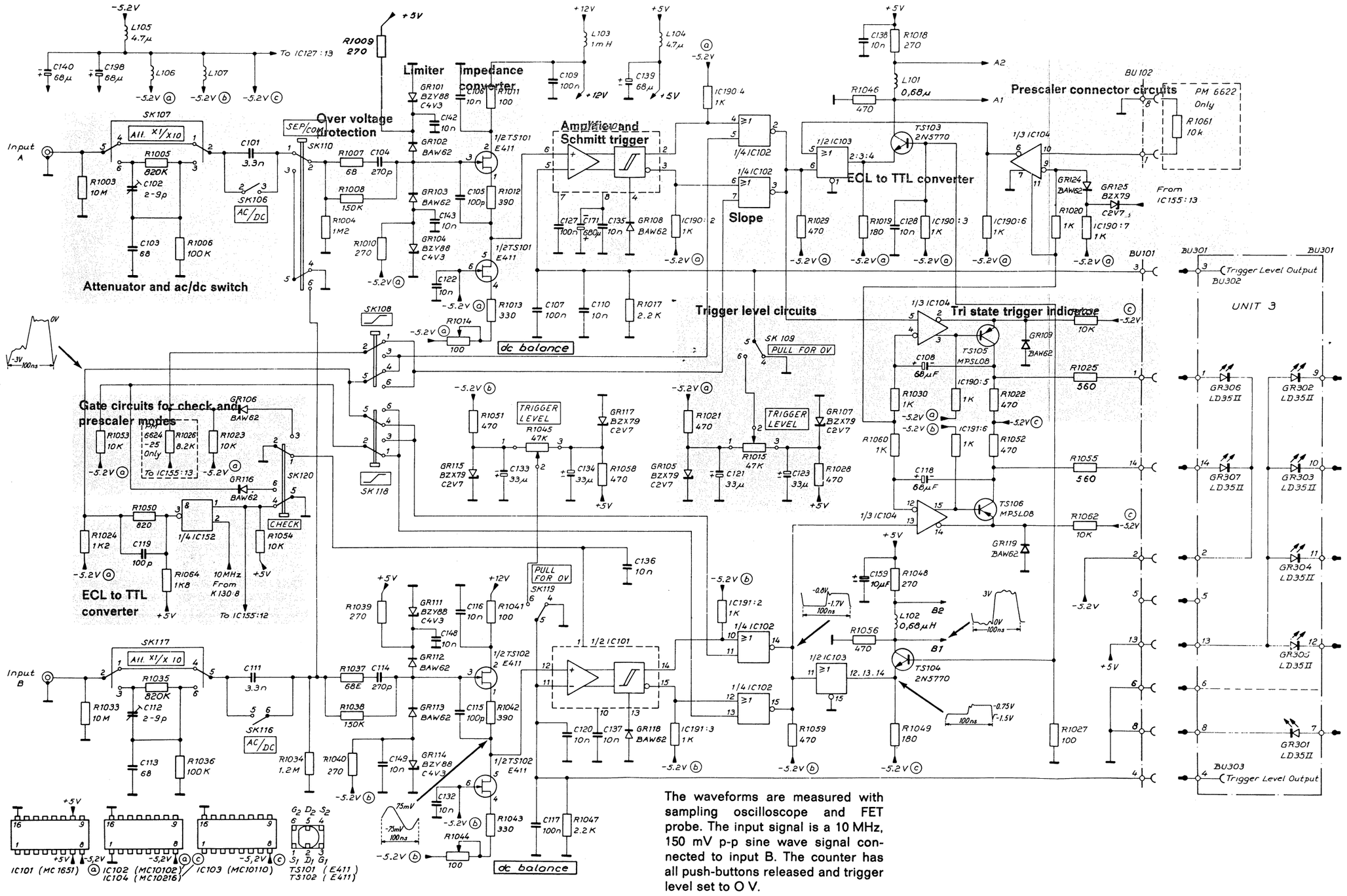
Count A Gated by B

MAIN GATE
TRANSFER
RESET
DATA
DISPL. CLOCK
ADDRESS DEC. POINT
DISPLAY TIME
MEMORY
WAFER 1
WAFER 2
WAFER 3
SK105
PULL FOR ∞
STAND BY
PART OF UNIT 4 TO PM6622
PART OF UNIT 4 TO PM6624 -25
GATE MONITOR EXT. RESET
INHIBIT
EXT. RESET
TRANSFER
PM 6622 only
PM6622 only

Measured signal

Gate signal

Main gate signal


Attenuator and ac/dc switch
Over voltage protection
Limiter
Impedance converter
Amplifier and Schmitt trigger
Slope
dc balance
Trigger level circuits
Tri state trigger indicator
ECL to TTL converter
Prescaler connector circuits
Gate circuits for check and prescaler modes
ECL to TTL converter
UNIT 3
Trigger Level Output
The waveforms are measured with sampling oscilloscope and FET probe. The input signal is a 10 MHz, 150 mV p-p sine wave signal connected to input B. The counter has all push-buttons released and trigger level set to O V.